DERIVATIONS FROM SYNTAX TO PHONOLOGY AND THEIR CONSTRAINTS

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A DISSERTATION PRESENTED

by

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B.A. in English Linguistics, Tohoku University

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Abstract

This thesis investigates restrictions on various linguistic operations and phenomena within the latest framework of generative grammar called the *Minimalist Program* (MP), which assumes two kinds of constraints: (i) constraints regarding the principle of *efficient computation* and (ii) *bare output conditions* or *interface conditions*.

In chapter 2, I will investigate applications of some counter-cyclic operation called *Late Merge* (LM), which is empirically motivated but diverges from efficient computation. Given the Phase Theory, which ensures efficient computation, I will propose to restrict applications of LM by a phase-based condition on syntactic operations, i.e. *Phase Impenetrability Condition*. Then, the proposed analysis limits applications of LM to syntactically accessible domains under the proposed phase-

based derivation.

In chapter 3, I will explain restrictions on various phonological phenomena as a consequence of *Labeling Algorithm* (LA), which is originally proposed by Chomsky (2013) for interpretation of SOs at interfaces. After pointing out some problem with Chomsky's LA, I propose a new labeling mechanism based on Copy Deletion whereby an XP-YP structure can be labeled through Copy Deletion within Narrow Syntax. This proposal divides copies into two types in terms of their necessity for labeling and their interpretability at interfaces: copies unnecessary for labeling are deleted within Narrow Syntax, and hence cannot be interpreted at interfaces. In contrast, copies necessary for labeling are not deleted and hence can be interpreted at interfaces. The proposed labeling mechanism provides a straightforward account of various phonological phenomena in terms of Copy Deletion.

In chapter 4, I will attempt to deduce restrictions on some ellipsis and movement from an interface condition for providing legitimate phonological outputs. This attempt is based on Sato and Dobashi's (2016) phonological analysis of the *that*-trace effect, according to which extraction is banned if its phonological output is illegitimate. I will extend their analysis to other cases such as VP-ellipsis and preposition stranding movement. Specifically, I propose that these phenomena are prohibited if their phonological representations are illegitimate while they are allowed if the phonological illegitimacies are repaired in some way.

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Chapter 1

Introduction

This thesis investigates various linguistic phenomena within the latest framework of generative grammar called *the Minimalist Program* (MP). MP assumes that the faculty of language (FL) is a perfect computational system for providing sound/meaning pairs accessed by performance systems (sensorimotor (SM) systems/conceptual-intentional (C-I) systems) through corresponding interface levels (PF/LF). Under this model, FL is assumed to obey the principle of efficient computation and several conditions imposed by the performance systems (*bare output conditions* or *interface conditions*). In this chapter, I will first review recent studies on derivations from syntax to phonology. Then, I will introduce three important topics to be discussed in the following chapters.

1.1 Derivations from Syntax to Phonology in the Minimalist Program

Under the MP, linguistic expressions are derived through Narrow Syntax and PF/LF interfaces, and then used by SM/C-I systems. Syntax is the component to construct syntactic objects (SOs), which are inputs to the sound/meaning representations accessed by performance systems. In the current framework, SOs are constructed with an elementary operation *Merge*, which is formulated as follows:

(1) Merge (X, Y) = {X, Y}

Merge takes two elements, X and Y, and yields an unordered set {X, Y}. This operation is assumed to do nothing other than the set formation, and therefore it does not determine labels or linear orders of the set. Merge applies freely in two ways. If neither of the two merge-mates is part of the other, it is called *External Merge* (EM). In contrast, if either of the two merge-mates contains the other, it is called *Internal Merge* (IM). The latter option is what was previously analyzed as *Move*, and we assume that "moved" materials leave their copies where they are originally placed (the *Copy Theory of Movement*).

Within MP, which assumes that FL is perfectly designed, application of Merge is considered to observe some principles of computational efficiency. A natural requirement for efficient computation is *No Tampering Condition* (Chomsky (2008)): Merge of X and Y leaves the two SOs unchanged. This condition forces Merge to target the whole SOs constructed thus far (i.e. "cyclic" application of Merge) so as not to change internal structures or merge-relations of the SOs. In addition, syntactic derivations are also constrained by the *Phase Theory* (Chomsky (2000, 2001, 2004, 2008)), according to which SOs are constructed phase-by-phase, and they are sent to interfaces at each phase through *Transfer*. The phase-based derivation is subject to the principle of computational efficiency: (i) linguistic computation deals with only smaller part than the whole derivation at once, and (ii) memory load is reduced by "forgetting" transferred SOs in a technical sense. Given this, syntactic operations are constrained so as to limit its application to syntactically available positions within a phase. This is known as the *Phase Impenetrability Condition* (PIC) (cf. Chomsky (2000, 2001)).

At the end of the syntactic derivation, SOs are mapped onto sound/meaning representations so that the mapping results can meet several conditions imposed by

SM/C-I systems (*bare output conditions* or *interface conditions*). In the remainder of this section, I review studies on two interface-level processes necessary for SM systems, labeling and phonological structuring.

Let us begin with labeling. Chomsky (2013) assumes that SOs must be labeled for interpretation at interfaces. However, labels are not automatically obtained through syntactic derivation because labeling function is now not equipped in structure building operations. Therefore, Chomsky (2013) proposes *Labeling Algorithm* (LA) in (2) independently.

(2) Labeling Algorithm

a. $[_{\alpha}$ H XP] α = H

b. $[_{\alpha}$ XP YP] (i) [XP $[_{\alpha}$ XP YP]] α = YP

(ii) $[_{\alpha}$ $XP_{[F]}$ $YP_{[F]}$] α = <F, F>

H = Head, XP, YP = Phrase, F = Feature

According to LA, labels are determined on the basis of minimal search. When a head and a phrase are merged as in (2a), the former is selected as a label because it is located by minimal search from the top of the SO. On the other hand, when two phrases are merged as in (2b), the SO cannot be uniquely labeled in the same way as in (2a) because minimal search locates two heads (what is called "XP-YP problem"). This kind of SO is labeled by two strategies (2bi, ii). One is raising either phrase (2bi): If a phrase raises, the other serves as a label because a copy left behind is invisible to the minimal search for labeling. The other strategy is feature sharing via *Agree* (2bii): If merged phrases share some feature through Agree, the feature serves as a label like <F, F>. Thus, LA assigns labels to SOs based on the three labeling

strategies, enabling SOs to receive interpretations at interfaces.

Next, let us turn to phonological structuring. At the PF interface, syntactic structures are mapped onto phonological ones that represent prosodic information necessary for externalization. The phonological representations are hierarchically structured by variously-sized phonological constituents, in accordance with several prosodic conditions. One of the phonological constituents is called *phonological phrase* (Φ-phrase), which is subject to the following condition:

(3) Function words cannot form a prosodic phrase (= Φ-phrase) on their own.
(Sato and Dobashi (2016: 333))

This condition means that function words are insufficient to form a Φ-phrase, and hence they must compose it with a lexical word. This is because function words are phonologically too weak to form a Φ-phrase by themselves. Φ-phrases that satisfy condition (3) are accessed by SM-systems as a legitimate phonological unit. Thus, phonological structuring applies so as to meet conditions on every phonological constituent.

1.2 Three Topics of the Thesis

1.2.1 Counter-Cyclic Mergers and Their Restrictions

Given the framework of the MP, I will address three topics concerning derivations from syntax to phonology. The first topic is about a cyclic application of Merge. Specifically, I will claim that some counter-cyclic merger that violates NTC is constrained by PIC. In the literature, some previous studies propose various NTC-violating operations. One of the operations is *Late Merge*, which inserts a

certain constituent into a phrase after the targeted phrase has moved (see Lebeaux (1988), Fox (2002), Bhatt and Pancheva (2004), Takahashi (2006), Takahashi and Hulsey (2009), among others). This operation has been assumed to be necessary to explain an argument/adjunct asymmetry regarding the Binding Condition C in (4).

(4) a. *Which claim that Mary had offended $John_i$ did he_i repeat?

b. Which claim that offended $John_i$ did he_i repeat? (Landau (2007: 149))

Both sentences contain an R-expression within the *wh*-phrases and a subject pronoun co-referential with the R-expression. The ungrammaticality of (4a) is straightforwardly explained as violation of the Binding Condition C under the copy theory of movement: An R-expression within the base-generated *wh*-copy is bound by the co-referential subject pronoun.

(5) [which claim that Mary had offended $John_i$] did **he_i** repeat
[which claim that Mary had offended **$John_i$**]

However, this analysis cannot apply to the grammatical sentence in (4b). To explain the Condition C bleeding effect, Lebeaux (1988) proposes Late Merge (LM), whereby adjuncts can be merged after its merge-mate has moved. Assuming this operation, sentence (4b) has the derivation in (6).

(6) [which claim [that offended $John_i$]] did he_i repeat [which claim]

Here, the relative clause is inserted in the displaced position of the *wh*-phrase. The

copy of the R-expression is not bound by the co-referential pronoun, and hence Condition C violation is not triggered.

Thus, LM explains the Condition C bleeding effect. However, it is controversial to admit this operation as a syntactic operation because it violates NTC: LM of the NP-adjunct in (6) changes the merge-mate of the targeted NP from the *wh*-operator to the late-merged adjunct. Therefore, taking LM deviates from the computationally efficient system in terms of NTC. Although I assume LM to explain the argument/adjunct asymmetry in (4), I will propose to constrain LM by PIC.

My argument starts with some previous observations that Condition C violation cannot be avoided by LM if a relevant adjunct is inserted into a deeply embedded position of a displaced material, as exemplified by the following sentences:

(7) a. Eat food at Mary$_i$'s party, she$_i$ knows I wouldn't.

b. *Eat food that Mary$_i$ cooks, she$_i$ knows I wouldn't. (Landau (2007: 155))

In VP-fronting sentences, Condition C violation can be avoided if the relevant R-expression is contained within the VP-adjunct as in (7a), but it cannot be bled if an R-expression is contained within the NP-adjunct as in (7b). The contrast suggests that LM is applicable in the former but not in the latter.

In order to explain the contrast, I will propose that LM is constrained by the PIC, which is formulated as in (8) following Obata's (2010) investigation.

(8) In phase α with head H, internal structures of the complement of H are not accessible to operations outside α; only H, its edge and the complement of H are accessible to such operations.

This condition allows a phase-head-complement (as well as a phase-head and a phase-edge) to be accessed by syntactic operations. Therefore, it allows an adjunct to be late-merged with a phase-head-complement counter-cyclically. In contrast, it prohibits LM from applying to internal structures of a phase-head-complement. According to (8), sentences in (7) are analyzed as in (9), where syntactically inaccessible domains are represented by half-tone-dot-meshing:

(9) a. [$_{vP}$ t_I v-eat [$_{VP}$[$_{VP}$ t_{eat} [$_{DP}$ [$_{NP}$ food]]][$_{PP}$ at Mary's party]]] she knows
I wouldn't [$_{vP}$ t_I v-eat [$_{VP}$ t_{eat} [$_{DP}$ [$_{NP}$ food]]]]

b. [$_{vP}$ t_I v-eat [$_{VP}$ t_{eat} [$_{DP}$ [$_{NP}$[$_{NP}$ food][$_{CP}$ that Mary cooks]]]]] she knows
I wouldn't [$_{vP}$ t_I v-eat [$_{VP}$ t_{eat} [$_{DP}$ [$_{NP}$ food]]]]

LM of the VP-adjunct applies to an accessible position of the fronted VP, while that of the NP-adjunct targets an inaccessible position. As a result, only the former operation is possible.

Thus, restriction on LM can be accounted for under the Phase Theory. I will pursue the phase-based restriction on applications of LM and consider further empirical consequences.

1.2.2 Labeling Based on Copy Deletion

Next, let us move on to the second topic of this thesis concerning labeling. As for this topic, I will first point out a problem with the LA proposed by Chomsky (2013, 2015), and then propose an alternative mechanism for labeling that is based upon Copy Deletion in Narrow Syntax. The discussion starts by considering how the original LA determines labels in A'-movement environment. Chomsky assumes that

an argument must take part in <φ, φ> labeling at its agreement position such as a subject position. However, the labeling should be impossible when the argument undergoes A'-movement. This is because a lower copy created by IM is invisible to labeling computation, as schematized in (10).

(10) $[DP_i \ldots [_{??} DP_i\ T_{[\varphi]} \ldots]]$

Chomsky (2015) proposes that labeling applies before A'-movement so that an argument can take part in <φ, φ> labeling before being invisible to LA. However, this rule order (labeling → raising) is also problematic if we assume that labeling applies as part of the Transfer operation (cf. Chomsky (2015: 6)). According to this assumption, PIC prevents an argument from raising after labeling because it becomes syntactically inaccessible through Transfer at the timing of labeling.

(11) a. <φ, φ> labeling through Transfer

Transfer

$[H_{Phase} \ldots [\underline{_{<\varphi,\ \varphi>}}\ DP_{[\varphi]}\ T_{[\varphi]}\ [_{vP} \ldots]]]$

b. * IM of *DP*

Transfer

$[DP\ H_{Phase} \ldots [_{<\varphi,\ \varphi>}\ DP_{[\varphi]}\ T_{[\varphi]}\ [_{vP} \ldots]]]$

Therefore, the PIC-based consideration requires raising to precede labeling. Thus, Chomsky's proposal cannot derive A'-movement with its launching site labeled.

In order to solve this problem, I propose the following algorithm for labeling:

(12) a. All copies are visible for LA.

b. A copy that causes an XP-YP problem is deleted before labeling, and a remaining phrase serves as a label.

According to the new labeling mechanism, an XP-YP structure can be labeled by deleting one phrase and selecting the other as a label. The deletion operation must apply within Narrow Syntax so as to determine labels at the timing of Transfer, and hence I call it "NS-Copy Deletion." Notice that, according to the modified LA, an argument can take part in <φ, φ> labeling even after A'-movement as long as a relevant copy is not deleted.

(13) a. IM from an agreement position

[DP C [$_{\alpha}$ DP$_{[\varphi]}$ T$_{[\varphi]}$ [$_{\beta}$ DP v …]]]

b. NS-Copy Deletion

[DP C [$_{\alpha}$ DP$_{[\varphi]}$ T$_{[\varphi]}$ [$_{\beta}$ ~~DP~~ v …]]]

c. Labeling at Transfer of the CP-Phase

[DP C/[$_{<\varphi, \varphi>}$ DP$_{[\varphi]}$ T$_{[\varphi]}$ [$_{vP}$ ~~DP~~ v …]]]

In this respect, my proposal is superior to the original LA.

As a consequence of the proposal, copies are also distinguished in terms of their interpretability at interface: Some copies deleted within Narrow Syntax cannot be interpreted at interfaces while other copies that are transferred to interfaces may be interpreted there. This kind of copy distinction can be observed through some phonological phenomena. For example, see the following sentences with *wanna*-contraction:

(14) a. Who do you want to/*wanna meet John?

b. Who do you want to/wanna meet?

Sentence (14a) involves *wh*-movement of the embedded subject, and disallows *wanna*-contraction. In contrast, sentence (14b) involves movement of the *wh*-object, and permits *wanna*-contraction. The contrast can be attributed to the presence or absence of intervention effect of silent copies if we assume that *wanna*-contraction requires PF-adjacency between *want* and *to* (cf. Jaeggli (1980)). The sentences in (14a) and (14b) have the structures in (15a) and (16a), respectively, under the assumption that that a clause-selecting verb is formed by External Pair-Merge of a v-head with a root (cf. Epstein, Kitahara and Seely (2016)). Then, they are mapped onto the linear orders in (15b) and (16b), respectively, by neglecting inherently null elements such as a covert C and a PRO subject:

(15) a. … [$_{vP}$ ~~who~~ ~~you~~ <√want, v> [$_{CP}$ ~~who~~ C [$_{<\varphi, \varphi>}$ who$_{[\varphi]}$ T$_{[\varphi]}$-to …

b. who do you do want <u>who</u> to meet meet John

(16) a. … [$_{vP}$ ~~who~~ ~~you~~ <√want, v> [$_{CP}$ ~~who~~ C [$_{<\varphi, \varphi>}$ PRO$_{[\varphi]}$ T$_{[\varphi]}$-to …

b. who do you do want to meet meet who

In (15a), a relevant copy of the *wh*-subject is required for <φ, φ> labeling, and hence it is transferred without being deleted. Then, the copy has the intervention effect on *wanna*-contraction at PF interface. In contrast, in (16a), a copy of the *wh*-object intervenes between *want* and *to*, but it is deleted for labeling. The copy does not prevent the required PF-adjacency, and hence *wanna*-contraction succeeds.

Thus, the restriction of the phonological phenomenon can be explained as a

consequence of the proposed labeling mechanism. I will present and discuss further empirical evidence for the copy distinction.

1.2.3 A Phonological Constraint on Linguistic Operations

The last topic is concerning with a constraint on phonological structuring. I will extend Sato and Dobashi's (2016) phonological analysis of the *that*-trace effect to VP-Ellipsis (VPE) and preposition stranding (P-stranding) movement, and then provide a unified account of these different phenomena. In MP, mapping to phonological structures is constrained by bare output conditions/interface conditions so that its outputs are legible for SM systems. Then, restrictions on some syntactic operations might be explained by the interface conditions on phonological mapping rather than syntactic constraints. In fact, Sato and Dobashi (2016) propose a phonological analysis of the the *that*-trace effect. In their analysis, *that*-trace configuration is disallowed because its phonological structure is illegitimate: Subject extraction creating the *that*-trace configuration removes a prosodic host for a phonologically weak word *that*. Specifically, they give sentence (17a) the phonological structure in (17b), where a Φ-phrase is expressed by bracket with Φ.

(17) a. Who$_i$ do you think (*that) t_i wrote the book?

b. who$_i$ do you think (*that t_i)$_\Phi$ (wrote)$_\Phi$ (the book)$_\Phi$

Here, the complementizer is left alone within a Φ-phrase. This is problematic because the word is phonologically too weak to form a Φ-phrase by itself. Therefore, the subject as a prosodic host for the complementizer cannot be extracted from behind the complementizer.

Sato and Dobashi also propose that the *that*-trace configuration is permitted if the phonological illegitimacy is repaired. One of the repair strategies is Focus Restructuring proposed by Kenesei and Vogel (1995):

(18) Focus Restructuring in English

If some word in a sentence bears focus, place a Φ-phrase boundary at its right edge, and join the word to the Φ-phrase on its left.

Adopting this prosodic restructuring rule, they explain that the *that*-trace configuration is permitted in the Right Node Raising construction if a complementizer is placed on the right edge of each conjunct. Here, focused elements are represented by **SMALL CAPITAL**.

(19) That's the guy Jim's been wondering **IF** and Tom's been saying **THAT** really likes Sue. (Sato and Dobashi (2016: 341))

The sentence is grammatical although the complementizers ***IF*** and ***THAT*** are stranded. Its phonological structure is analyzed as follows:

(20) a. That's the guy Jim's (been wondering)$_{\Phi}$ (**IF**)$_{\Phi}$ and Tom's (been saying)$_{\Phi}$ (**THAT**)$_{\Phi}$ really likes Sue.

→ Focus Restructuring

b. That's the guy Jim's (been wondering **IF**)$_{\Phi}$ and Tom's (been saying **THAT**)$_{\Phi}$ really likes Sue.

The phonological structure of (20a) is illegitimate in that the complementizers are left alone within a Φ-phrase. However, as (20b) shows, the illegitimacy is repaired by incorporating the focused complementizers into preceding Φ-phrases. Thus, the phonological representation is licensed, and hence the sentence is grammatical.

I will extend the phonological analysis to restriction on other phenomena such as VPE and P-stranding movement. First, VPE is possible in infinitival complement clauses but not in infinitival subject clauses.

(21) a. Mag Wildwood wants to read Fred's story, and I also want to __.
b. *You shouldn't play with rifles because to __ is dangerous.
(Johnson (2001: 440, 442))

As for P-stranding, it is licensed only if a PP including a moved phrase is focused.

(22) a. **WHICH VACATION** did John go to Hawaii **DURING**?
b. *Which vacation did John go **TO HAWAII** during?
(Takami (1988: 299, 320))

I will explain these restrictions in terms of phonological structuring. Specifically, I propose that VPE is licensed only if a phonologically weak infinitive marker is not left alone within a Φ-phrase. Given that VPE is licensed by a focused T-head (cf. Samko (2014) and López and Winkler (2000)), sentence (21a) has the following phonological derivation.

(23) a. … and I (also want)$_{\Phi}$ (**TO**)$_{\Phi}$ __

→ Focus Restructuring

b. … and I (also want **TO**)$_{\Phi}$ __

The resulting phonological structure of (23a) is illegitimate in that an infinitive marker is left alone within a Φ-phrase, but the illegitimacy is repaired through Focus Restructuring as in (23b). This kind of repair does not occur when Focus Restructuring is prevented. Kenesei and Vogel (1995) propose that Focus Restructuring cannot apply across an *intonational phrase* (ι-phrase), which is a phonological constituent larger than a Φ-phrase. Selkirk (1978) and An (2007) point out that a subject clause independently forms an ι-phrase, and hence sentence (21b) has the following phonological structure where an ι-phrase is expressed by bracket with ι.

(24) … because ((**TO**)$_{\Phi}$)ι is dangerous

→ Focus Restructuring is blocked

Here, Focus Restructuring is prevented by the ι-phrase boundary, and hence the resulting phonological structure remains illegitimate. Thus, the proposed phonological analysis account for the restriction on VPE in terms of phonological legitimacy..

Likewise, I propose that P-stranding is licensed if a phonologically weak preposition is not left alone within a Φ-phrase. The proposed analysis gives sentences in (22a) and (22b) the phonological structures in (25) and (26), respectively:

(25) a. **WHICH VACATION** did John (go)$_{\Phi}$ (to Hawaii)$_{\Phi}$ (**DURING**)$_{\Phi}$

→ Focus Restructuring

b. **WHICH VACATION** did John (go)$_{\Phi}$ (to Hawaii **DURING**)$_{\Phi}$

(26) a. which vacation did John (go)$_{\Phi}$ (**TO HAWAII**)$_{\Phi}$ (during)$_{\Phi}$

→ Focus Restructuring

b. which vacation did John (go **TO HAWAII**)$_{\Phi}$ (during)$_{\Phi}$

The eventual phonological structure of (25) becomes legitimate by applying Focus Restructuring to the stranded preposition, whereas that of (26) remains illegitimate because Focus Restructuring does not apply so as to repair the phonological illegitimacy. Therefore, P-stranding is licensed in the former sentence but prohibited in the latter.

Thus, the proposed phonological approach can explain restrictions on several linguistic operations in terms of their phonological outputs. I will provide further supports for this analysis by considering various examples of VPE and P-stranding.

1.3 Organization of the Thesis

In the next chapter, I try to explain restriction on applications of LM by the Phase Theory. Starting by some previous observations that LM cannot apply to a deeply embedded position, I will propose that LM is subject to PIC. Then, I will support this phase-based constraint on LM by presenting various data.

Chapter 3 proposes a new mechanism for labeling to explain various linguistic phenomena. After pointing out a problem with LA introduced by Chomsky (2013), I will propose a new labeling mechanism whereby an XP-YP structure can be labeled by Copy Deletion within Narrow Syntax. As a consequence of this proposal, copies

are distinguished in terms of their interpretability at interfaces. Then, based on the copy distinction, I will account for restrictions on various linguistic phenomena from the proposed new LA.

Chapter 4 tries to account for the distribution of some ellipsis and movement as a consequence of a constraint on phonological structuring. Introducing Sato and Dobashi's (2016) phonological analysis of the *that*-trace effect, I will provide a phonological analysis of VPE and P-stranding movement. I will claim that they are allowed only if the illegitimacies in their phonological structures are repaired in some way.

Chapter 5 concludes the thesis.

Chapter 2

Late Merge and Phase*

2.1 Introduction

In this chapter, I propose a new constraint on the operation called *Late Merge*, which inserts a certain constituent into a phrase after the targeted phrase has moved (see Lebeaux (1988), Fox (2002), Bhatt and Pancheva (2004), Takahashi (2006), and Takahashi and Hulsey (2009), among others). This operation has been assumed to be necessary to explain an argument/adjunct asymmetry regarding the Binding Condition C in (1).

(1) a. *Which claim that Mary had offended John$_i$ did he$_i$ repeat?

b. Which claim that offended John$_i$ did he$_i$ repeat? (Landau (2007: 149))

In sentence (1a), the R-expression *John* is contained within an argument clause of a moved *wh*-phrase. If it co-refers with the subject pronoun *he*, the sentence is ungrammatical. This is straightforwardly explained under the *Copy Theory of Movement*, according to which a moved element leaves its copy. Under this theory, sentence (1a) has the derivation of (2).

(2) [which claim that Mary had offended John$_i$] did **he$_i$** repeat
[which claim that Mary had offended **John$_i$**]

In (2), a full copy of the moved *wh*-phrase exists in its base-generated position. Hence, the R-expression within the lower copy is bound by the co-referential pronoun. This configuration excludes sentence (1a) due to a violation of Condition C, which requires R-expressions to be free.

Thus, the copy theory of movement explains the reconstruction effect, in which a moved phrase is interpreted in its base-generated position.

However, this analysis cannot apply to (1b), which would have the derivation of (3).

(3) [which claim that offended John$_i$] did **he$_i$** repeat [which claim that offended **John$_i$**]

(3) incorrectly suggests that Condition C is violated. To explain the Condition C bleeding effect, Lebeaux (1988) proposes Late Merge (LM), by which adjuncts can be merged after the targeted phrase has moved. As the result of this operation, sentence (1b) has the derivation in (4). Hereafter, the base-generated positions of materials within a moved phrase are emphasized by underline.

(4) [which claim [that offended John$_i$]] did he$_i$ repeat [which claim]

Here, the relative clause does not exist in the base-generated position of the *wh*-phrase, and it is merged after *wh*-movement. Since there is no copy of the R-expression in the c-command domain of the co-referential pronoun, a Condition C violation is circumvented. Thus, LM explains the grammaticality of sentence (1b).[1,2]

Although LM plays an important role in explaining the contrast in (1), this operation is sometimes restricted in certain environments. For example, Landau (2007) and Sauerland (1998) argue that this operation is prevented if it applies to a deeply embedded position. Their arguments are based on some empirical observations, but neither of them can provide sufficient explanations for the restrictions. In this chapter, I address the problem of how to constrain LM. I propose that LM is regulated by the *Phase Theory,* according to which structure building proceeds in terms of a chunk of structure called *phase*. Specifically, assuming a phase-based condition on structure

building operations (what I call "Modified Phase Impenetrability Condition"), I claim that LM only applies to the syntactically accessible positions. My proposal not only explains some previously observed restrictions on LM, but also has additional consequences: The proposed analysis explains (i) the inapplicability of LM to a conjunct of a coordinated NP and (ii) A-movement/A'-movement asymmetries regarding Condition C, in terms of a new possibility for LM that naturally follows from Phase Theory.

This chapter is organized as follows. In section 2.2, I review two previous works on restrictions on LM. Section 2.3 proposes a new constraint on LM that is based on the Phase Theory. In section 2.4, I discuss additional consequences of the proposed analysis. Section 2.5 is a conclusion.

2.2 Restrictions on Late Merge

It has been argued that LM does not freely apply. In this section, I review two previous works showing that LM cannot apply to a deeply embedded position of moved phrases. The first one is Landau (2007), which presents the following contrast:

(5) a. Eat food at Mary$_i$'s party, she$_i$ knows I wouldn't.

b. *Eat food that Mary$_i$ cooks, she$_i$ knows I wouldn't. (Landau (2007: 155))

The adjunct-PP in (5a) *at Mary's party* modifies the fronted VP *Eat food*, whereas the relative clause in (5b) *that Mary cooks* modifies the NP *food* within the preposed VP. The difference in the grammaticality suggests that the former avoids, but the latter triggers, a Condition C violation.

To account for the contrast in (5) Landau proposes the condition that late-adjunction cannot apply inside a predicate (Landau (2007: 156)). To see how this condition works, I illustrate the derivations of (5a, b) in (6a, b), respectively.

(6) a. [$_{VP}$[$_{VP}$ eat food][at Mary's party]] she knows I wouldn't [eat food]

b. [$_{VP}$ eat [$_{DP}$[$_{NP}$[$_{NP}$ food][that Mary cooks]]]] she knows I wouldn't [eat food]

In both cases, adjuncts must be late-merged after the predicate-movement so that the R-expression *Mary* can be free. In (6a), the VP-adjunct is merged with the fronted predicate itself. This operation is applicable because it does not violate Landau's condition that blocks LM inside a predicate. In contrast, LM of the NP-adjunct in (6b) targets the NP inside of the fronted predicate. This operation violates Landau's condition, and hence it is disallowed.

Although the proposed condition on LM captures the fact in (5), Landau does not attempt to derive it from deeper principles. That is, his proposal is insufficient in that it is unclear why the condition holds.

Sauerland (1998) presents another restriction on LM: A constraint on multiple adjunction, which is suggested by (7).

(7) a. Which computer compatible with his$_j$ that Mary$_i$ knew how to use did she$_i$ tell every boy$_j$ to buy?

b. *Which computer compatible with Mary$_i$'s that he$_j$ knew how to use did she$_i$ tell every boy$_j$ to buy? (Sauerland (1998: 52))

These sentences include a co-referential relation between the R-expression *Mary* and the pronoun *she*, and a variable binding relation between the QP *every boy* and the pronoun *his* (*he*). In (7a), the variable pronoun is contained within the inner-modifier of the *wh*-phrase and the R-expression is within the outer one. In (7b), the positions of the variable pronoun and the R-expression are reversed.

Sauerland attributes the contrast to the difference in the order of adjunction. He gives (7a)

the following derivation:

(8) a. … every boy to buy [which computer [compatible with his]]

b. [which computer [compatible with his][that Mary knew how to use]]
did she tell every boy to buy [which computer [compatible with his]]

As shown in (8a), the inner-modifier enters the derivation in the base-generated position of the *wh*-phrase. As a result, the variable pronoun in the modifier can be bound by the QP. In contrast, the outer-modifier is late-merged, as indicated in (8b) so that the R-expression can be free.

On the other hand, (7b) has the following derivation:

(9) a. … every boy to buy [which computer [that he knew how to use]]

b. [which computer [compatible with Mary's][that he knew how to use]] did she tell every boy to buy [which computer [that he knew how to use]]

Among the two modifiers, the outer one is merged from the beginning, as in (9a), and then, the inner one is inserted above the subject pronoun, as in (9b). Thus, the sentences in (7a, b) involve a different order of adjunction.

To explain the contrast in (7), Sauerland assumes that multiple adjunction obeys a kind of cyclicity: Late-adjunction must extend a targeted phrase. He attributes the restriction to Tada's (1993) proposal that LM obeys a modified version of the cyclicity constraint on structure building, which restricts applications of LM to the specifier of the current cyclic domain.[3] Under the restriction, LM in (7a, b) are analyzed as (10a, b), respectively. Here, I use "whP0" to represent the modified noun, and express the structure formed by the first-adjunction as "whP1," and the one constructed by the second-adjunction as "whP2."

(10) a. [$_{CP}$[$_{whP}$][$_{whP0}$ which computer][compatible with his]]$_i$ did she tell every boy to buy t_i]

↑

LM

[$_{CP}$[$_{whP2}$[$_{whP1}$[$_{whP0}$ which computer][compatible with his]][that Mary knew how to use]]$_i$ did she tell every boy to buy t_i]

b. [$_{CP}$[$_{whP1}$[$_{whP0}$ which computer][that he knew how to use]]$_i$ did she tell every boy to buy t_i]

↑

LM

[$_{CP}$[$_{whP1}$[$_{whP2}$[$_{whP0}$ which computer][compatible with Mary's]][that he knew how to use]]$_i$ did she tell every boy to buy t_i]

In (10a), LM targets the entire *wh*-phrase (whP1) at the specifier of the current cyclic domain (CP-Spec), and therefore it is applicable under Tada's condition on LM. In contrast, LM in (10b) accesses the internal structure of the specifier of CP (whP0). Since this operation violates the condition on late-adjunction, it is impossible. Thus, Sauerland explains the cyclicity of adjunction.

However, this analysis is problematic because adjuncts modifying nominals are, in fact, not merged with a moved phrase itself. NP-adjuncts are generally assumed to be merged with an NP. That is, adjunction always targets an internal structure of a *wh*-"DP" at the CP-Spec, as indicated by the simple case of (11)

(11) Which claim that offended John$_i$ did he$_i$ repeat?

[$_{CP}$[$_{DP}$ which [$_{NP}$[$_{NP}$ claim][that offended John]]] did he repeat [$_{DP}$ which [$_{NP}$ claim]]]

Tada's condition is problematic in that it incorrectly excludes all LM of NP-adjunct in DP-movement, and therefore, Sauerland's account based on this condition is also problematic.

In sum, the previous analyses point out that LM is prevented if it applies to a deeply embedded position, but they do not provide a principle-based explanation of the restriction on LM.

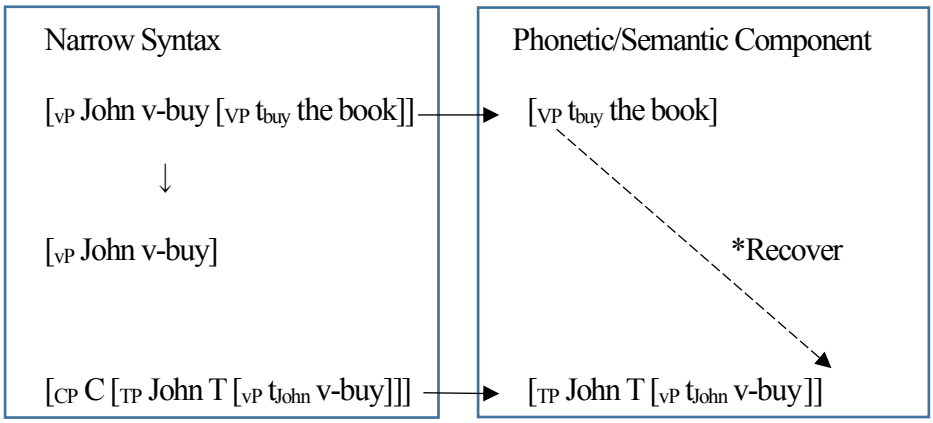
2.3 Deriving Restrictions on Late Merge

In this section, I propose a new constraint on LM in terms of Phase Theory, which plays an important role in the recent framework. To present the phase-based condition, first, I briefly review some previous works on phase.

The concept of phase is introduced by Chomsky (2000) for the purpose of the reduction of computational burden. The term *phase* refers to a subpart of the derivation. At each phase-level, the computational system takes lexical items from lexicon, and forms a syntactic object. At the final stage of the derivation at a phase-level, a certain constituent is sent to a system external to syntax by the operation called *Transfer*. Chomsky (2000) assumes that phase-head-complement is transferred as soon as a phase is completed. Then, transferred materials are removed from syntax, and thus this process reduces computational burden. Such transferred materials get inaccessible to operations of higher phases. This is known as *Phase Impenetrability Condition* (PIC).

Obata (2010) makes a close investigation of the Transfer system. On the one hand she also argues that the information about transferred materials is lost from syntax, but on the other hand she points out that, if Transfer leaves nothing in syntax, it is impossible to obtain a complete sentential interpretation and linear order. To illustrate this point, consider the derivation in (12).

(12) … that John bought the book.



In (12), first, vP-phase is completed, and then the phase-head-complement is transferred. Note that, as the result of this process, syntax loses the information that the transferred constituent VP is merged with the phase-head v. Then, the second Transfer applies at CP-phase. At this stage, the firstly transferred VP should be recovered within the secondly transferred TP. However, nothing ensures the recovery because computational system does not know that VP is merged with v-head. Thus, if Transfer leaves nothing in syntax, a complete sentence cannot be obtained at PF/LF.

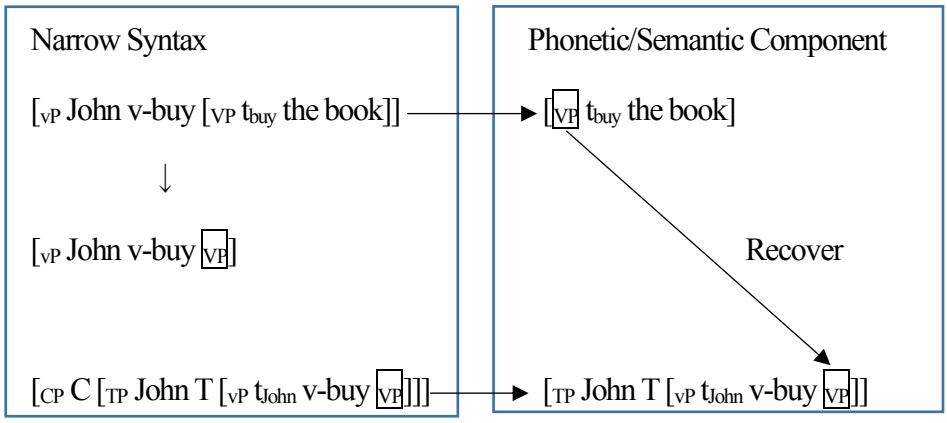
To guarantee the recoverability of transferred materials, Obata (2010) proposes the modified Transfer in (13).

(13) *Label-Copying Transfer*

The transferred phase-head-complement leaves a copy of only its label when it undergoes Transfer.

Given the modified Transfer, the derivation proceeds as in (14). Here, I will use enclosure to represent the label of the top node of a transferred constituent.

(14) … that John bought the book.



In (14), Transfer at vP-phase leaves the copy of the label VP. This copy is contained within the secondly transferred TP, and therefore the content of VP can be recovered in this position. Thus, the Label-Copying Transfer allows re-assembly of individually transferred materials.

This modification of the Transfer system has an effect on the accessible domain in syntax. Since Label-Copying Transfer leaves the copy of the top node of transferred materials, it is accessible to operations. Accordingly, the condition on structure building operations (PIC) is also modified. Under the well-known version of PIC in Chomsky (2000), only a phase-head and its edge are accessible to operations outside the phase. Instead of this, I assume the modified version in (15) (for similar definition, see Bošković (2015)).

(15) Modified Phase Impenetrability Condition (MPIC)

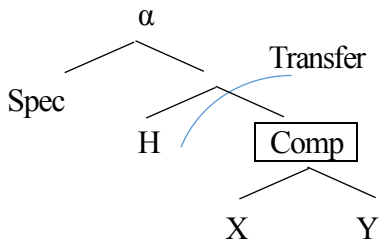
In phase α with head H, internal structures of the complement of H are not accessible to operations outside α; only H, its edge and the complement of H are accessible to such operations.

The MPIC states that a phase-head, a phase-edge and a phase-head-complement are still accessible to syntax after Transfer, but internal structures of the phase-head-complement are not. The

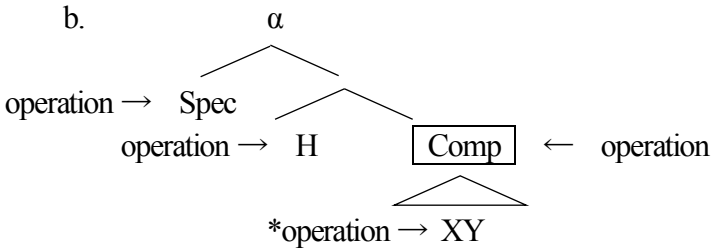
modified version of PIC is different from the original one in whether a phase-head-complement is accessible to operations of higher phases.

Now, I will illustrate how the MPIC works at a phase with head H.

(16) a. Completion of a phase → Transfer



b.



In (16a), the phase is completed, and the phase-head-complement is transferred. At this stage, the MPIC allows syntactic operations to target the phase-head, the phase-edge, and (the copy of) the phase-head-complement (*H*, *Spec*, and *Comp*) but not internal constituents of the transferred domain (*X* and *Y*), as indicated in (16b).

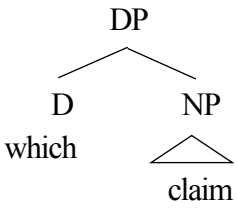
Assuming the MPIC, I propose that LM obeys this condition on structure building operations. In addition, following Chomsky (2001, 2004, 2008) and Citko (2014), I assume that DP, vP, and CP function as a phase. Thus, the restriction on LM is imposed at each of DPs, vPs, and CPs.

Now, we are ready to explain applications of LM. The first sentence to see is the one presented in (1b), repeated here as (17).

(17) Which claim that offended John$_i$ did he$_i$ repeat?

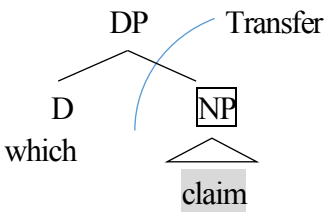
Consider the derivation of (17) under the current phase system. At the start of the derivation, the *wh*-DP is constructed without the relevant relative clause, as in (18).

(18) $[_{DP}$ which $[_{NP}$ claim]]



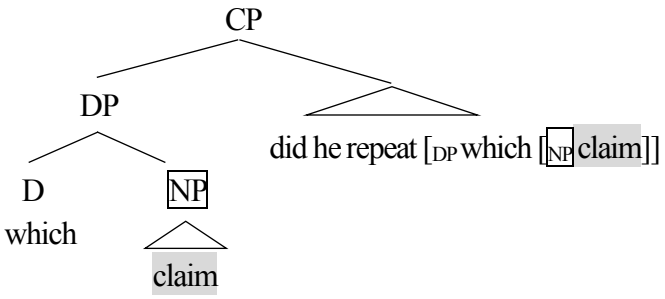
As soon as the DP-phase is completed, the phase-head-complement is transferred, as in (19). Hereafter, half-tone-dot-meshing marks internal structures of a transferred domain, which are inaccessible to any syntactic operation. (for internal structures of NP, see section 2.4.2.1.)

(19) $[_{DP}$ which $[_{NP}$ claim]]



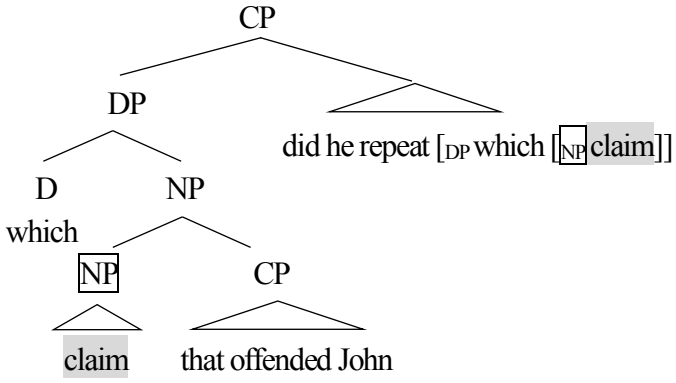
At a later stage, the *wh*-phrase moves into CP-Spec through each phase-edge, to yield the following structure:

(20) [DP which [NP claim]] did he repeat [DP which [NP claim]]



What is important here is that there are some syntactically available positions within a moved phrase: The phase-head of the *wh*-DP (D-head *which*) and its phase-head-complement (NP) remain accessible even after *wh*-movement. At this stage, the adjunct is merged with the NP of the *wh*-phrase, as in (21).

(21) [DP which [NP[NP claim][CP that offended John]]] did he repeat [DP which [NP claim]]



Since the MPIC allows syntactic operations to target a phase-head-complement, LM of the relative clause is permitted. Hence, a Condition C violation can be circumvented.

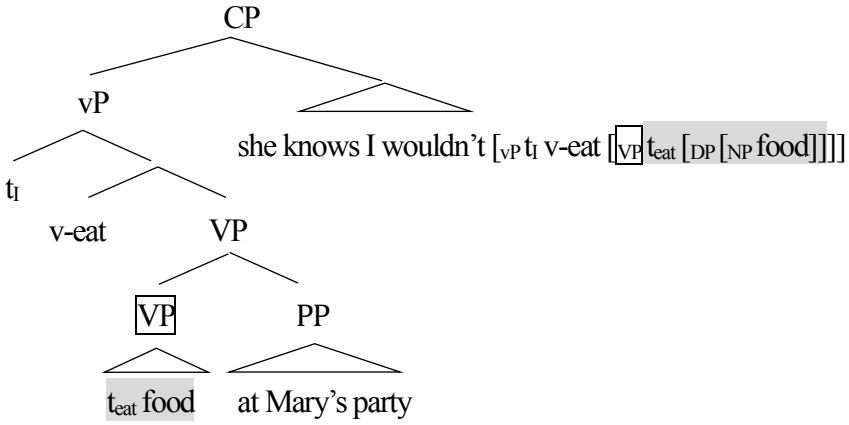
Next, consider the sentences in (5), repeated below.

(22) a. Eat food at Mary$_i$'s party, she$_i$ knows I wouldn't.

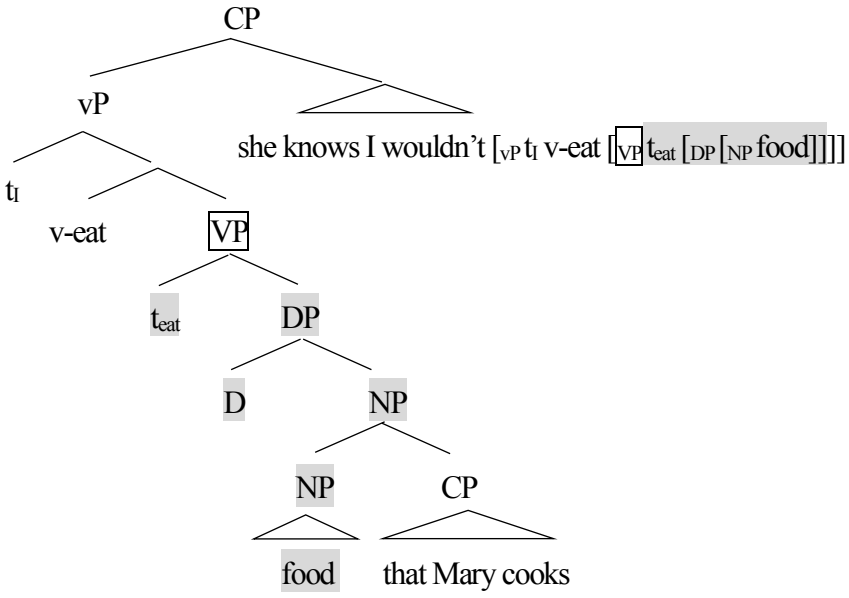
b. *Eat food that Mary$_i$ cooks, she$_i$ knows I wouldn't.

(22a, b) have the derivations of (23a, b), respectively.

(23) a. $[_{vP}\, t_I$ v-eat $[_{VP}[_{VP}\, t_{eat}\, [_{DP}\, [_{NP}$ food]]][$_{PP}$ at Mary's party]]] she knows I wouldn't $[_{vP}\, t_I$ v-eat $[_{VP}\, t_{eat}\, [_{DP}\, [_{NP}$ food]]]]



b. $[_{vP}\, t_I$ v-eat $[_{VP}\, t_{eat}\, [_{DP}\, [_{NP}[_{NP}$ food][$_{CP}$ that Mary cooks]]]]] she knows I wouldn't $[_{vP}\, t_I$ v-eat $[_{VP}\, t_{eat}\, [_{DP}\, [_{NP}$ food]]]]



Here, there are some syntactically unavailable positions within the moved vPs. The VP-adjunct is late-merged outside the inaccessible domain, while the NP-adjunct is inserted into the relevant

domain. Since the derivation of (23a), but not that of (23b), is legitimate, only (22a) is grammatical.[4]

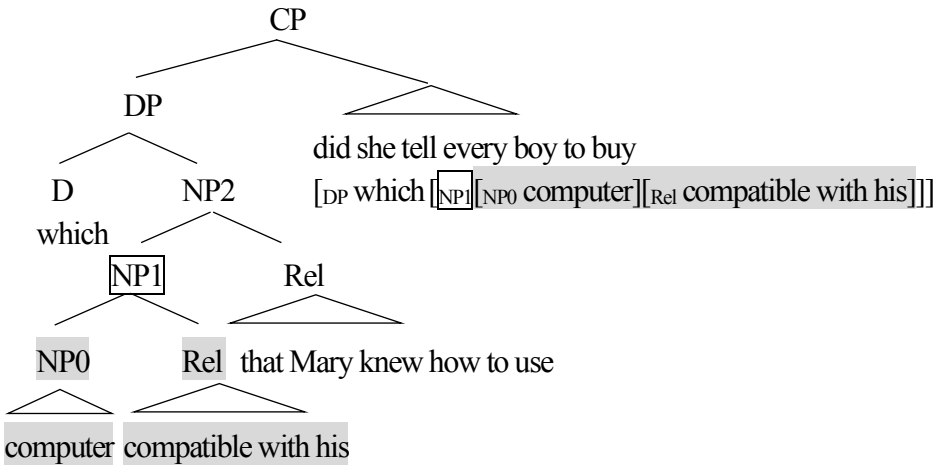
Furthermore, the MPIC explains the contrast in (7), repeated in (24).

(24) a. Which computer compatible with his_j that $Mary_i$ knew how to use did she_i tell every boy_j to buy?

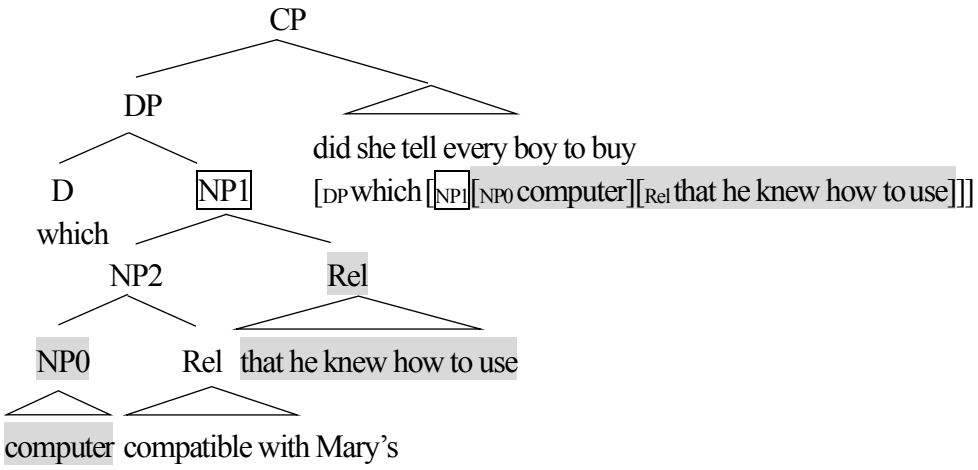
b. *Which computer compatible with $Mary_i$'s that he_j knew how to use did she_i tell every boy_j to buy?

These sentences have the derivations in (25).

(25) a. [DP which [NP2[NP1][NP0 computer][Rel compatible with his]][Rel that Mary knew how to use]]] did she tell every boy to buy [DP which [NP1][NP0 computer][Rel compatible with his]]]



b. [DP which [NP1][NP2[NP0 computer][Rel compatible with Mary's]][Rel that he knew how to use]]] did she tell every boy to buy [DP which [NP1][NP0 computer][Rel that he knew how to use]]]



LM of the outer-modifier in (25a) targets the entire restrictor NP of the *wh*-determiner (NP1), while late-adjunction of the inner-modifier in (25b) applies to an embedded phrase (NP0). Since the former, but not the latter, accesses a syntactically available position, only sentence (24a) is grammatical.[5]

In this section, I have proposed that LM obeys the MPIC in such a way that it can apply to a whole transferred constituent, but not to its internal structures.[6]

2.4 Further Consequences

In this section, I provide further supports for the proposed analysis of LM, in terms of the late-adjunction to a conjunct of a coordinated NP and A-movement/A'-movement asymmetries regarding Condition C.

2.4.1 Late Merge within Coordinated Phrases

First, let us consider the following sentences:

(26) a. Which argument and remarkable proposal in John$_i$'s paper did he$_i$ deny?

b. ?? Which argument in John$_i$'s paper and remarkable proposal did he$_i$ deny?

My informants judge that sentence (26b) is degraded, compared to sentence (26a). In these sentences, a coordinated NP is modified by an adjunct-PP, which includes an R-expression co-referential with a subject pronoun. If the adjunct-PP adjoins to the entire coordinated phrase *argument and remarkable proposal* as in (26a), the sentence is legitimate. On the other hand, if it modifies one conjunct of the coordinated phrase *argument* as in (26b), the sentence is illegitimate.[7] The contrast suggests that LM bleeds a Condition C violation in the former, but not in the latter. The view that the ungrammaticality of (26b) results from the failure of LM and succeeding Condition C violation is supported by sentence (27a), where the positions of the R-expression and the pronoun are reversed, compared to (26b). The derivation of (27a) is represented in (27b).

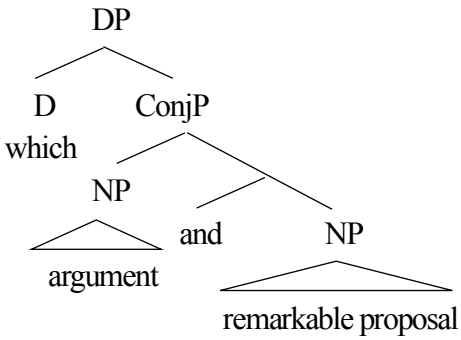
(27) a. Which argument in his$_i$ paper and remarkable proposal did John$_i$ deny?

b. [which argument in his paper and remarkable proposal] did John deny
[which argument in his paper and remarkable proposal]

Since it is possible to modify one conjunct of a coordinated NP if the resulting configuration does not violate Condition C, we can conclude that the degradation of (26b) is attributed to the failure of LM.

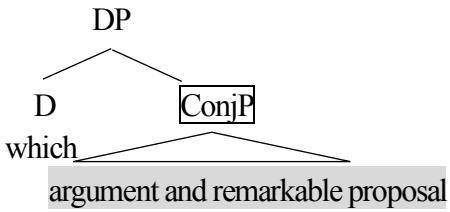
The proposed phase system provides a straightforward account of the contrast between (26a, b). First, consider sentence (26a). At the beginning of the derivation, the *wh*-DP is constructed without the adjunct-PP, as in (28). In this chapter, I adopt Zhang's (2010) argument that a coordinate structure forms a conjunct phrase (ConjP) in which the coordinator is the head, and the two conjuncts appear as the specifier and complement of the head. In addition, I assume that ConjP is not a phase, unless this assumption is falsified.

(28) [$_{DP}$ which [$_{ConjP}$ [$_{NP}$ argument] and [$_{NP}$ remarkable proposal]]]



After the completion of the DP-phase, its phase-head-complement is transferred, as in (29).

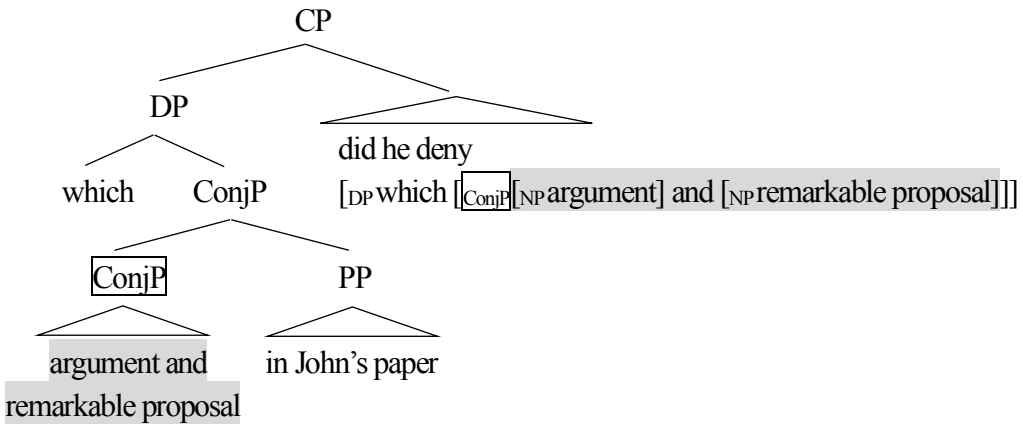
(29) [$_{DP}$ which [$_{ConjP}$ [$_{NP}$ argument] and [$_{NP}$ remarkable proposal]]]



At this stage, the entire ConjP is still accessible to syntax. After *wh*-movement, LM of the adjunct-PP applies to the syntactically available constituent, as in (30).

(30) [$_{DP}$ which [$_{ConjP}$ [$_{ConjP}$ [$_{NP}$ argument] and [$_{NP}$ remarkable proposal]] [$_{PP}$ in John's paper]]]

did he deny [$_{DP}$ which [$_{ConjP}$ [$_{NP}$ argument] and [$_{NP}$ remarkable proposal]]]

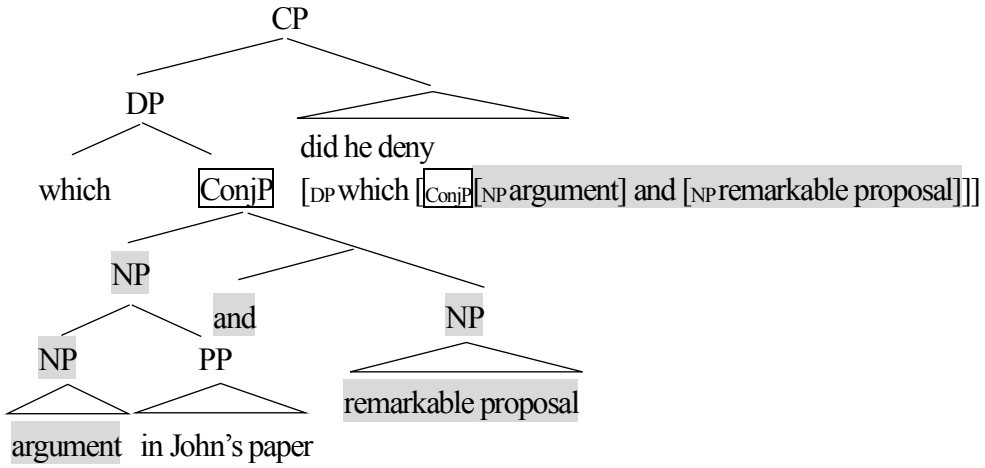


This late-merger obeys the MPIC, and hence sentence (26a) is grammatical.

Let us turn to (26b). The derivation proceeds in the same way as (28, 29). Then, the adjunct-PP is late-merged with one conjunct of the coordinated phrase, as in (31).

(31) [$_{DP}$ which [$_{ConjP}$[$_{NP}$[$_{NP}$ argument][$_{PP}$ in John's paper]] and [$_{NP}$ remarkable proposal]]]

did he deny [$_{DP}$ which [$_{ConjP}$[$_{NP}$ argument] and [$_{NP}$ remarkable proposal]]]



Here, LM targets an internal constituent of the transferred domain. The operation violates the MPIC, and therefore sentence (26b) is ungrammatical. Thus, the phase-based approach explains the restriction on LM regarding coordinated NPs.

Furthermore, the current analysis predicts that, if a conjunct of a coordinated phrase is accessible to syntax, LM can apply to the position. This is borne out by the following examples.

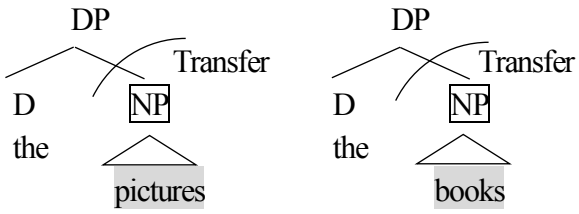
(32) The pictures that John$_i$ likes and the books, he$_i$ had to sell. (Sportiche (2019: 421))

(33) ? Eat food in John$_i$'s house and sleep in his$_i$ bed, he$_i$ thought Bill would.

In these sentences, a modifier adjoins to one conjunct of a fronted coordinated phrase. Let us consider the derivation of (32). In the beginning, each DP is constructed without an adjunct, and a

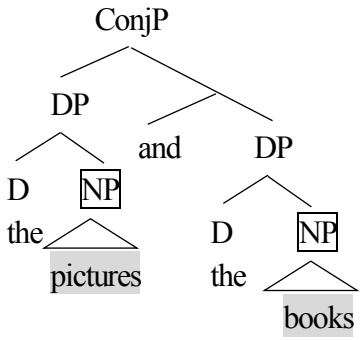
phase-head-complement is transferred, as in (34).

(34) [$_{DP}$ the [$_{NP}$ pictures]] [$_{DP}$ the [$_{NP}$ books]]



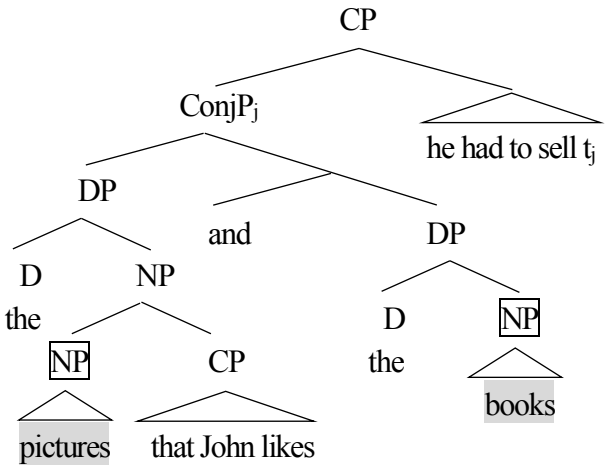
Then, the two DPs are coordinated, to yield the following structure:

(35) [$_{ConjP}$[$_{DP}$ the [$_{NP}$ pictures]] and [$_{DP}$ the [$_{NP}$ books]]]



Here, each conjunct has some syntactically accessible positions. After the conjunct phrase moves, an NP-adjunct is inserted into one conjunct of the coordinated DP, as in (36).

(36) $[_{ConjP}[_{DP}$ the $[_{NP}[_{NP}$ pictures$][_{CP}$ that John likes$]]]$ and $[_{DP}$ the $[_{NP}$ books$]]]_j$ he had to sell t_j

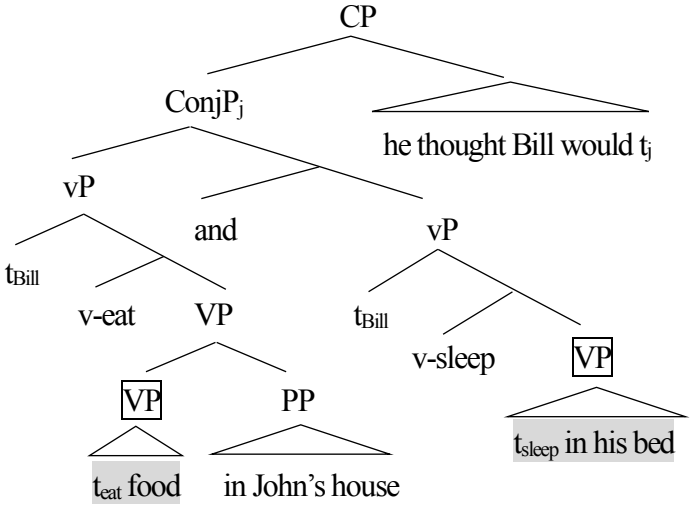


The late-merger satisfies the MPIC, and therefore the output is legitimate.

The same kind of analysis also applies to sentence (33): LM of a VP-adjunct targets an accessible constituent within a conjunct, as in (37).

(37) $[_{ConjP}[_{vP}\ t_{Bill}$ v-eat $[_{VP}[_{VP}\ t_{eat}$ food$][_{PP}$ in John's house$]]]$

and $[_{vP}\ t_{Bill}$ v-sleep $[_{VP}\ t_{sleep}$ in his bed$]]]_j$, he thought Bill would t_j



This late-merger satisfies the MPIC so that sentence (33) is grammatical.

In this subsection, I have shown a consequence of the proposed phase system. Specifically, the MPIC blocks late-adjunction to one conjunct of a coordinated NP. In contrast, LM can apply

to one conjunct of a coordinated DP or that of a coordinated VP because its target is syntactically available.

2.4.2 A-movement/A'-movement Asymmetry

2.4.2.1 Phase-Based Analysis

Next, I demonstrate that the proposed phase system also captures the asymmetries between A-movement and A'-movement regarding Condition C. One of the asymmetries is that A-movement, but not A'-movement, is grammatical if a modifier is late-merged with a deeply embedded constituent of a moved phrase, as indicated by the following examples:

(38) a. *Which book of the woman $Bill_i$ admires did he_i give to his_i parents?
(*Bill admires* modifies *woman*) (Sauerland (1998: 47))

b. A picture of the team that $John_i$ coached seems to him_i to be expected by each girl to be good. (*that John coached* modifies *team*)

In these sentences, an adjunct is used to modify an embedded NP of a moved phrase. This contrast suggests that A-movement can avoid a Condition C violation A'-movement cannot bleed.

This A-movement/A'-movement asymmetry is accounted for by assuming a new possibility for LM: LM of a restrictor NP.[8] Before explaining the contrast in (38), I illustrate how the new possibility is deduced from phase theory. Phase Theory allows untransferred materials to be accessible to syntactic operations of higher phases. This means that structure building operations other than adjunction should be possible if they target some accessible constituent. Consequently, it should be possible to apply LM of a restrictor NP to a moved D-head, as in (39).

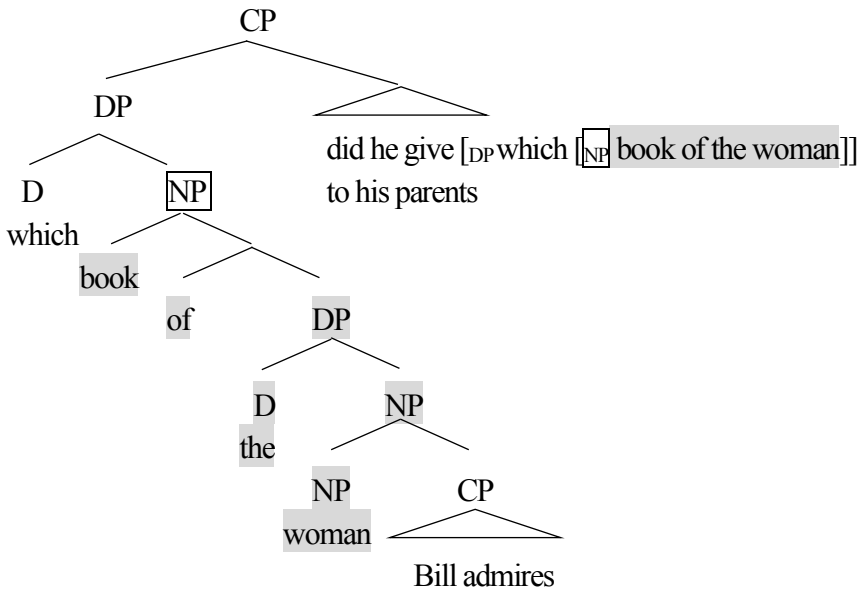
(39) $[_{DP}D\ [_{NP}\ldots N \ldots]] \ldots [_{DP}D]$

In this derivation, only a D-head is base-generated in the beginning, and after the movement of the D-head, its restrictor NP is late-merged. This late-merger is allowed because the moved D-head (phase-head) is not an internal structure of a Transfer domain. Following Takahashi (2006) and Takahashi and Hulsey (2009), I assume that such LM is possible in A-movement, but not in A'-movement, because of the Case property of late-merged NPs. The authors assume that DP as a whole, both a determiner and an NP, needs to receive Case (cf. Case Filter in Chomsky (1980)). In A-movement from a non-Case position to a Case position, an NP inserted after movement can receive Case in the derived position. In contrast, in A'-movement from a Case position to a non-Case position, a late-merged NP cannot get Case because it is introduced outside the domain of its Case-assigner. In the latter situation, the failure of Case-assignment causes a crash of the derivation.

Now, let us return to the examples which show A-movement/A'-movement asymmetry. The case of A'-movement (38a) has the derivation in (40).

(40) $[_{DP}$ which $[_{NP}$ book of $[_{DP}$ the $[_{NP}[_{NP}$ woman$][_{CP}$ Bill admires$]]]]]$ did he give

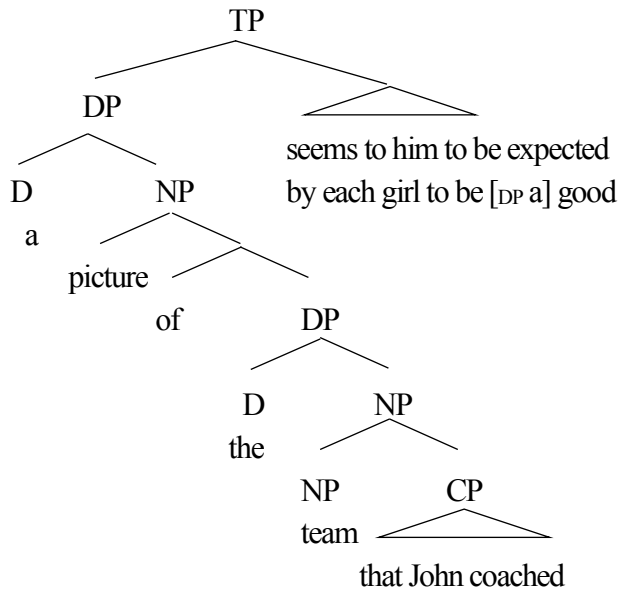
$[_{DP}$ which $[_{NP}$ book of $[_{DP}$ the $[_{NP}$ woman$]]]]$ to his parents



Since this derivation involves A'-movement, it does not allow LM of a restrictor NP. Furthermore, the MPIC blocks LM of the relative clause *Bill admires* to the NP node of *woman*. Hence the derivation of (40) is illegitimate and (38a) is ungrammatical.

Next, consider the case of A-movement (38b), which has the derivation of (41).

(41) [$_{DP}$ a [$_{NP}$ picture of [$_{DP}$ the [$_{NP}$[$_{NP}$ team][$_{CP}$ that John coached]]]]] seems to him to be expected by each girl to be [$_{DP}$ a] good



In this derivation, only the determiner *a* is introduced without its restrictor NP in the base-generated position of the subject. The restrictor NP including the relative clause *picture of the team that John coached* is late-merged above the experiencer-argument, which potentially binds co-referential elements in lower positions. This late-merger satisfies the MPIC, and hence (38b) is grammatical.

In sum, the A-movement/A'-movement asymmetry is naturally derived from the current phase system. A-movement can bleed a Condition C violation that A'-movement cannot because the former, but not the latter, allows LM of a restrictor NP.

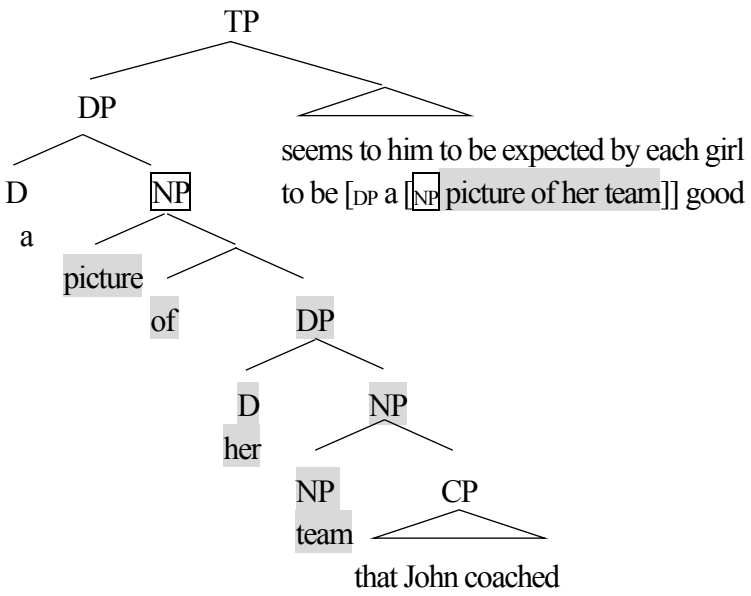
The proposed analysis predicts that, if LM of a restrictor NP is blocked in A-movement for

some reason, the MPIC also blocks LM of an adjunct applied to a deeply embedded position. This prediction is borne out by (42).

(42) *A picture of her$_i$ team that John$_j$ coached seems to him$_j$ to be expected by each girl$_i$ to be good.

This sentence has a variable binding relation between *each girl* and *her*. To introduce the variable pronoun within the domain of the QP, at least the restrictor NP *picture of her team* must enter the structure before A-movement, as in (43).

(43) [$_{DP}$ a [$_{NP}$ picture of [$_{DP}$ her [$_{NP}$[$_{NP}$ team][$_{CP}$ that John coached]]]]] seems to him to be expected by each girl to be [$_{DP}$ a [$_{NP}$ picture of [$_{DP}$ her [$_{NP}$ team]]]] good.



LM of the relative clause violates the MPIC, and hence (42) is ungrammatical.

One might attribute the ungrammaticality of (42) to Transfer of an unvalued feature. That is, it might be problematic to transfer the restrictor NP without valuing its Case feature, since the

unvalued Case feature should cause a crash of the derivation. However, it is not a real problem because such an argument incorrectly excludes sentence (44a), which has the derivation of (44b).

(44) a. One picture of himself$_i$ seemed to everybody$_i$ to be too small. (Sauerland (1998: 58))

b. [$_{DP}$ one [$_{NP}$ picture of himself]] seemed to everybody to be [$_{DP}$ one [$_{NP}$ picture of himself]] too small

As shown in the derivation, the restrictor NP *picture of himself* must be introduced in the domain of the QP *everybody*. The grammaticality of this sentence suggests that the derivation does not crash even if the NP is transferred before it agrees with a matrix T. Based on this fact, I attribute the ungrammaticality of (42) to the inapplicability of LM, but not to Transfer of unvalued features.[9]

Now, let us turn to another kind of A-movement/A'-movement asymmetry exemplified in the following sentences:

(45) a. *Which argument that John$_i$ is a genius did he$_i$ believe? (Fox (1999: 164))

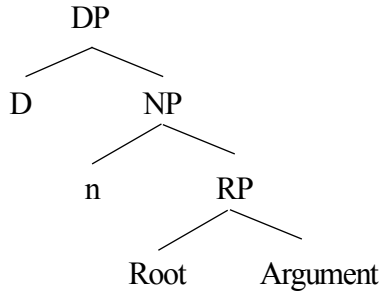
b. Every argument that John$_i$ is a genius seems to him$_i$ to be flawless. (ibid.: 192)

In (45), an R-expression is contained within an argument of a moved phrase. In this environment, A'-movement in (45a) is ungrammatical, which has been taken to suggest that arguments, unlike adjuncts, cannot be late-merged. In contrast, A-movement in (45b) is grammatical even if an R-expression is within an argument.

This contrast is also explained under the current phase system along with some assumption about nominal structures. To explain the impossibility of LM of an argument in (45a), let me first make a structural assumption about NP: I assume that an NP with an argument consists of at least a nominalizer and a root, and that an argument is merged with a root. Then, an NP with an argument

forms the following structure:

(46)



As depicted here, an argument is inside an NP. This structural assumption is supported by *one*-substitution. It is well-known that an argument is inside the domain that a *one*-anaphor replaces, as indicated in (47) where the behavior of an argument is compared with that of adjuncts.

(47) this [[[student of physics] with long hair] from France] and

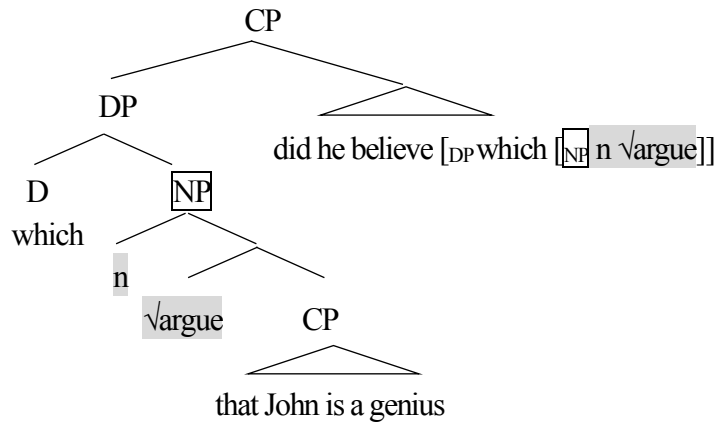
a. *that one of chemistry (with long hair from France)

b. that one (from Belgium) (with short hair) (Hornstein and Nunes (2008: 619))

These sentences show that the argument *of chemistry* cannot appear when *one*-substitution applies while the other prepositional phrases can.[10] Ackema (2015) explains this fact by assuming that arguments are included in an NP, a constituent *one*-anaphor substitutes for.

Now, we are ready to explain the A-movement/A'-movement asymmetry in (45). Let me start with the case of A'-movement in (45a), which suggests that arguments cannot be late-merged. The inapplicability of such LM is explained under the phase-based analysis. If an argument were late-merged, sentence (45a) would have the derivation of (48).

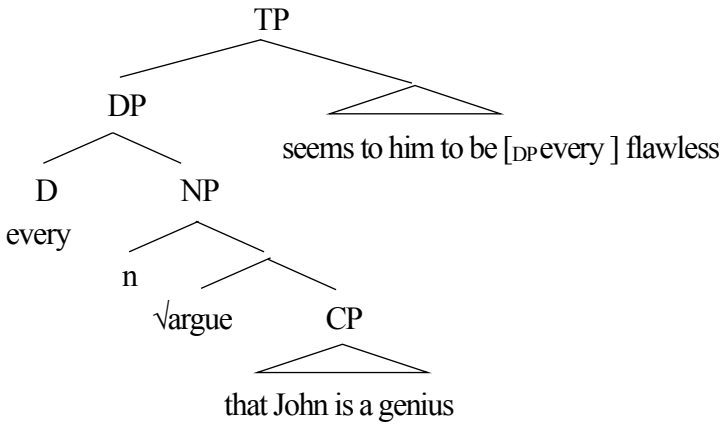
(48) [$_{DP}$which [$_{NP}$ n [$_{RP}$ √argue [$_{CP}$ that John is a genius]]]] did he believe [$_{DP}$which [$_{NP}$ n [$_{RP}$ √argue]]]



Here, the argument clause *that John is a genius* is late-merged with the root √*argue*. Since this operation violates the MPIC, it is impossible.

In contrast, the example involving A-movement in (45b) has the derivation of (49).

(49) [$_{DP}$every [$_{NP}$n [$_{RP}$ √argue [$_{CP}$that John is a genius]]]] seems to him to be [$_{DP}$ every] flawless



Since A-movement allows LM of the restrictor NP including the relevant argument, sentence (45b) can bleed a Condition C violation. Thus, the proposed phase system explains the A-movement/A'-movement asymmetry straightforwardly.

Summarizing this subsection, I have claimed that A-movement/A'-movement asymmetries

are explained by assuming LM of a restrictor NP, which is a natural consequence of the phase-based approach.

2.4.2.2 Comparison with Previous Approaches

Before closing this section, let me consider two previous approaches to the fact that LM of an argument is impossible, as I showed in (45a). The first one is Lebeaux's (1988), which attempts to capture the fact by assuming Projection Principle (cf. Chomsky (1981)) in (50) (the statement is brought from Takahashi and Hulsey (2009: 394)).

(50) Projection Principle

The subcategorization property of lexical items must be satisfied throughout the derivation.

This principle requires that arguments must, but adjuncts need not, be inserted from the beginning. Consequently, only adjuncts can be late-merged.

However, this explanation is conceptually untenable because Projection Principle does not hold in the current framework. In addition, this kind of explanation cannot range over the example of (51a), which has the derivation of (51b) under Projection Principle.

(51) a. Every argument that $John_i$ is a genius seems to him_i to be flawless.

b. [every argument that John is a genius] seems to him to be [every argument that John is a genius] flawless.

In (51b), Projection Principle requires the argument clause *that John is a genius* to enter the derivation from the beginning. This analysis incorrectly rules out sentence (51a) due to a Condition C

violation.

Next, let me turn to the approach by Fox (2002), Takahashi (2006), and Takahashi (2010), among others: the LF-interpretability approach to LM, according to which any kind of LM is possible as long as its LF output is legitimate. They assume that LM is permitted if resulting movement-chains are compositionally interpretable. Their analysis is based on the semantic procedure called *Trace Conversion* in (52).

(52) Trace Conversion (Takahashi (2010: 355))

Variable Insertion: D (Pred) → D [(Pred) λy(y = x)]

Determiner Replacement: D [(Pred) λy(y = x)] → the [(Pred) λy(y = x)]

Trace Conversion has two components. First, *Variable Insertion* introduces a predicate of type <e,t> (λy. [y=x]) to a lower copy. This step establishes a dependency between the lower copy and the λ-operator introduced by DP-movement. The inserted predicate is combined with a restrictor NP within the copy via the composition rule *Predicate Modification*, which conjoins two predicates of type <e,t> (see Heim and Kratzer (1998: 126) for the formulation of this rule). In addition, *Determiner Replacement* converts the lower copy into a definite description of type e, which makes possible the composition of the converted copy of the moved DP and its sister that takes an argument of type e.

Now, we are ready to discuss how the LF-interpretability approach captures the applicability of LM. The proponents of this approach give the representation of (53) to the sentence where an argument is late-merged after A'-movement:

(53) *[which argument [that John$_i$ is a genius]] λx. did he$_i$ believe

[which [argument$_{<t,<e,t>>}$ [λy. [y=x]$_{<e,t>}$]]]

In this representation, the NP in the base-generated position has the type <t,<e,t>> because its first argument is not yet saturated. This NP cannot compositionally combine with a predicate λy.[y=x] because Predicate Modification cannot conjoin them. Since Trace Conversion fails to produce a legitimate movement-chain, this LM is disallowed.

In contrast, LM of an adjunct can yield a legitimate LF output: An NP within a lower copy of a *wh*-phrase can combine with an inserted predicate since such an NP is of type <e,t>, as in (54). (In addition, the NP of the moved DP combines with a late-merged adjunct via Predicate Modification.)

(54) [which argument [that John$_i$ made]] λx. did he$_i$ believe
[which [argument$_{<e,t>}$ [λy. [y=x]$_{<e,t>}$]]]

The LF output is interpretable, and therefore this LM is permitted.

Although this kind of analysis covers a wide range of data involving LM, it is not without problems: The LF-interpretability approach cannot deal with Condition C bleeding effects without Trace Conversion. Takahashi (2010) notes that "Trace Conversion is applicable only when a moved constituent is a constituent headed by a D-type head" (Takahashi (2010: 356)). This means that D-type movement can yield legitimate movement-chains via Trace Conversion, but non-D-type movement (e.g. predicate-movement) cannot. Consequently, as Takahashi argues, non-D-type movement should be semantically vacuous movement, which does not have movement-chains. That is, non-D-type movement cannot have any semantic effect. However, this kind of approach cannot capture the Condition C bleeding effect in a predicate-movement in (5a), repeated here as (55).

(55) Eat food at Mary$_i$'s party, she$_i$ knows I wouldn't.

The absence of a Condition C violation means that the non-D-type movement has a semantic effect so that the fronted predicate can be associated with the late-merged adjunct. The LF-interpretability approach must explain why the semantic effect exists in a predicate-movement.[11]

In this subsection, I critically reviewed the two alternative approaches to the inapplicability of LM to arguments. Lebeaux's approach is conceptually untenable, and it cannot explain anti-reconstruction effect in A-movement with an argument. LF-interpretability approach cannot explain anti-reconstruction effect in predicate-movement.

2.5 Conclusion

In this chapter, I have argued that LM is constrained by the Phase Theory. I have adopted a modified version of Phase Impenetrability Condition, and proposed that LM obeys this condition. As a result, the late-mergers can apply to a whole transferred constituent but not to its internal structures. The proposed phase system can explain restrictions on LM presented by Landau (2007) and Sauerland (1998). In addition, my proposal provides a straightforward account of the prohibition of LM to a conjunct of coordinated NPs and the A-movement/A'-movement asymmetries regarding Condition C.

Notes to Chapter 2

* This chapter is a revised version of Saito (2019a).

1. The Condition C bleeding effect has been analyzed in various ways. Chomsky (2004) and Sportiche (2016) attempt to explain the absence of a Condition C violation by assuming not LM, but other ways of interpreting adjuncts.

2. Thus, LM is empirically motivated, but some previous studies point out several conceptual problems for this operation: LM is not subject to some conditions imposed on the elementary syntactic operation Merge. For example, this operation violates *No Tampering Condition*, which prohibits Merge of X and Y from changing the two SOs: LM of an adjunct changes a merge-relation of a targeted phrase from an original merge-mate to the late-merged adjunct. Despite the conceptual difficulty, I admit LM as a syntactic operation, and claim that this operation observes a constraint on syntactic operation PIC.

3. Tada (1993) proposes a modified cyclicity constraint based on the "minimal domain." For the detailed discussion, see chapter 2 of Tada (1993).

4. An anonymous reviewer points out that Heycock (1995) observes that AP-fronting can bleed a Condition C violation with an NP-adjunct if the target of LM is referential as in (ia), but it cannot if the target of LM is non-referential as in (ib).

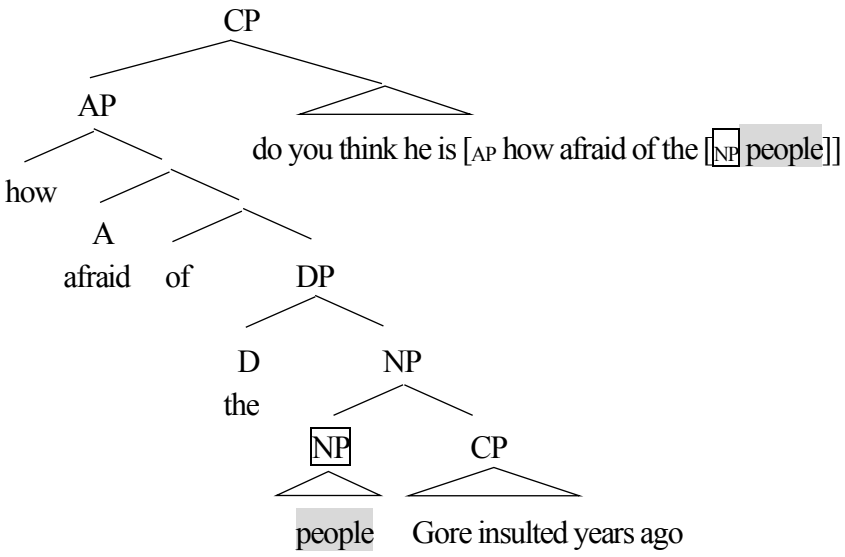
(i) a. [How afraid of the people Gore$_i$ insulted years ago]$_j$ do you think he$_i$ is t$_j$ now?

b. *[How afraid of some question Gore$_i$ hasn't prepared for]$_j$ do you think he$_i$ is t$_j$?

(Heycock (1995: 554))

I consider that the anti-reconstruction effect in (ia) should be analyzed by the current proposal. The absence of a Condition C violation in (ia) can be explained if AP is not a phase (unfortunately, I could not find convincing arguments that AP is not a phase, there are analyses that do not take AP as a phase (cf. Citko (2014))). Then, (ia) has the derivation of (ii).

(ii) [$_{AP}$ how afraid of [$_{DP}$ the [$_{NP}$[$_{NP}$ people][Gore insulted years ago]]]] do you think he is [$_{AP}$ how afraid of [$_{DP}$ the [$_{NP}$ people]]] now



Since AP is not a phase, its internal structures are accessible within the moved AP. Hence, LM can target the accessible constituent.

In contrast, I assume that the reconstruction effect in (ib) results from some independent factor: It should not be explained by the phase-based approach. This is supported by the fact that vP-fronting, unlike AP-fronting, cannot bleed a Condition C violation with an NP-adjunct, whether the target of LM is referential or non-referential.

(iii) a. *[Deny the accusations Harry$_i$ made]$_j$, no doubt he$_i$ expected Jane would t$_j$.

b. *[Criticize a student that John$_i$ taught]$_j$, he$_i$ said Mary did t$_j$. (Landau (2007: 155, 156))

5. An anonymous reviewer points out that the analysis of (25b) does not hold if the outer-modifier is late-merged at vP-Spec, and the structure formed by the LM does not undergo DP-phase-level Transfer. I depict the potential derivation below.

(i) a. Completion of DP-phase and Transfer

[$_{DP}$ which [$_{NP0}$ computer]]

b. LM of the Outer-Modifier at vP-Spec without Transfer of NP1

[$_{vP}$[$_{DP}$ which [$_{NP1}$[$_{NP0}$ computer][that he knew how to use]]] every boy v-buy t$_{buy}$ [$_{DP}$ which [$_{NP0}$ computer]]]

c. LM of the Inner-Modifier

[$_{CP}$[$_{DP}$ which [$_{NP1}$[$_{NP2}$[$_{NP0}$ computer][compatible with Mary's]][that he knew how to use]]] did she tell [$_{TP}$ every boy to [$_{vP}$[$_{DP}$ which [$_{NP1}$[$_{NP0}$ computer][that he knew how to use]]] t$_{every\ boy}$ v-buy t$_{buy}$ [$_{DP}$ which [$_{NP0}$ computer]]]]]

The outer-modifier is allowed to be late-merged at vP-Spec because the variable pronoun *he* within it can be bound by the QP *every boy* at TP-Spec. Suppose that, the newly formed structure NP1 does not undergo Transfer at this stage, as in (ib). Then, transferred material would be only NP0. Since, NP0 is accessible in this situation, LM of the inner-modifier can target it.

To avoid this possibility, I assume that a phase-head-complement newly formed via LM is transferred as soon as the LM applies. It is not unreasonable, given that Transfer applies in order to reduce computational burden. Under this assumption, LM of the inner-modifier is blocked in the similar way to (25b).

(ii) $[_{CP}[_{DP}$ which $[\boxed{NP1}[_{NP2}[_{NP0}$ computer][compatible with Mary's]][that he knew how to use]]] did she tell $[_{TP}$ every boy to $[_{vP}[_{DP}$ which $[\boxed{NP1}[_{NP0}$ computer][that he knew how to use]]] $t_{\text{every boy}}$ v-buy t_{buy} $[_{DP}$ which $[\boxed{NP0}$ computer]]]]]

This assumption is confirmed by the examples such as (iii) where an outer-modifier is late-merged but it is introduced before an inner-one. However, unfortunately, the data is not as clear as I would like it to be.

(iii) [Which computer [compatible with Mary_i's][that he_j talks about to Jane_k]]$_l$ does she_i think every boy_j $t_{l'}$ seems to her_k to try to buy $t_{l'}$?

6. Although the current proposal adopts LM, we might dispense with it if we reconsider applications of an elementary syntactic operation "Merge." LM differs from the primitive operation Merge in that the former does not obey a condition imposed on the latter (e.g. No Tampering Condition (Chomsky (2005))). That is, Merge must apply in such a way as to extend an already formed syntactic object, while LM does not have to. However, if we abandon the cyclicity constraint on Merge, then it is possible to subsume LM under the primitive structure building operation.

The reconsideration of applications of Merge can be extended to some other counter-cyclic operations such as head-movement in (i).

(i) a. Construction of vP

$[_{vP}$ Subject v $[_{VP}$ V Object]]

b. V-to-v head-movement

$[_{vP}$ Subject v-V $[_{VP}$ t_V Object]]

A V-head moves to a v-head, and therefore it does not extend an already constructed syntactic object vP. The counter-cyclic-movement is allowed if we assume that Merge is not constrained by the cyclicity, but by the MPIC because it applies to an accessible target. The same kind of analysis might apply to the movement of a subject to TP-Spec (cf. Chomsky (2016)).

Exploration of the possibility for subsuming "LM" under "Merge" is out of the scope of this chapter. I will leave further investigation for future research.

7. For my informants, if the NP-adjunct modifies the second conjunct, the sentence is also ungrammatical.

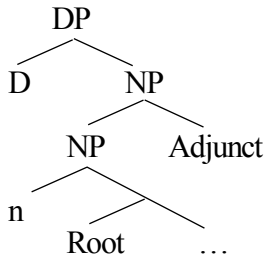
(i) ??Which argument in Mary's paper and proposal in John$_i$'s paper did he$_i$ deny?

8. The possibility has already been proposed in Takahashi (2006). However, I do not adopt his approach for the reason that I put in subsection 2.4.2.2.

9. It has been argued in Stjepanović and Takahashi (2001), Bošković (2007), and Richards (2012), among others, that Agree is not subject to PIC. Following these studies, I assume that materials contained inside a transferred domain remain accessible in regard to Probe-Goal relations. Hence, in (43) and (44b), the NPs can receive nominative Case at the stage where they agree with a matrix T.

10. I assume that adjuncts are (or can be) merged with the maximal projection of an NP, as in (i).

(i)



This is supported by the fact that adjuncts can appear after the application of *one*-substitution, as illustrated in (47).

11. Sentence (55) suggests that predicate-movement forms movement-chains so that it has semantic effect (the fronted predicate can be associated with the late-merged adjunct). Note that it does not mean that the fronted predicate is fully interpreted in its derived position. It seems that a modified predicate must be interpreted in its base-generated position even if it is associated with a late-merged adjunct, as indicated in (i).

(i) Throw away the picture of himself$_{??k/j}$ at Mary$_i$'s party, she$_i$ knows Bill$_k$ thinks John$_j$ did.

(i) suggests that the base-generated copy of the fronted predicate is interpreted for anaphor-binding. This leads me to conclude that, although the modified part (predicate) and the modifier (late-merged adjunct) in (55) are associated, they are interpreted in a different position at LF. This situation is similar to that of sentence (ii).

(ii) Which picture of himself$_j$ in Mary$_i$'s collection does she$_i$ think John$_j$ likes?

Here, the modified noun with an anaphor is interpreted in the base-generated position of the *wh*-

phrase for anaphor-binding, but the adjunct-PP containing an R-expression is interpreted above the co-referential subject pronoun.

Now, we have to find a semantic procedure other than Trace Conversion, or modify it to capture semantic effects of non-D-type movement. I leave this problem for future research.

Chapter 3

Copy Deletion-Based Approach to Labeling*

3.1 Introduction

In this chapter, I propose to modify Chomsky's (2013, 2015) *Labeling Algorithm*, and explore its consequences. In Chomsky (2013), he assumes that syntactic objects (SOs) are constructed by the simplest Merge, which takes X and Y and forms a two membered set {X, Y} without determining its label. However, he also assumes that labels are required for interpretation at interfaces (that is, C-I interpretation and externalization), and proposes Labeling Algorithm (LA). LA is based on a kind of minimal search, which locates a head that is the closest from the top of a constructed SO. This can straightforwardly determine labels of SOs composed of a head and a phrase ({H, XP}), because minimal search locates the head as the closest head. On the other hand, the algorithm cannot determine labels of SOs composed of two phrases ({XP, YP}) because minimal search finds two heads (X and Y), and therefore it cannot determine the label uniquely. Chomsky (2013) proposes two strategies for labeling the XP-YP structures: raising either of the two phrases and building on a shared (agreement) feature. However, some previous works point out that these strategies are not without problems (cf. Abe (2016), Emoto (2013), Mizuguchi (2019), Shim (2018) and others).

This chapter tries to solve the problems by proposing that an XP-YP structure can be labeled through deletion of either phrase, and replacing one of the two strategies noted above for XP-YP structures with a new proposal. Given that labeling applies as part of the Transfer (cf. Chomsky (2015)), the relevant deletion

operation must apply before Transfer so as to make unlabelable SOs labelable. I assume that the deletion applies within Narrow Syntax and hence I name it *NS-Copy Deletion*. In consequence of the proposal, copies that cause a labeling problem are deleted within Narrow Syntax. Then these copies cannot be transferred, and therefore they do not have any effect at interfaces. On the other hand, copies required for labeling must not be deleted by the timing of labeling. This kind of copies can be sent to interfaces, and hence they have some effect at interfaces. Thus, my proposal distinguishes copies in terms of their necessity for labeling and their interpretability at interfaces. I will present some empirical evidence for my proposal, focusing on phonological effects.

This chapter proceeds as follows. I will first review Chomsky's (2013, 2015) original LA and point out some of its problems in section 3.2. Next, I will propose a modified version of LA that is based on Copy Deletion in section 3.3. Section 3.4 will discuss some consequences of the modified LA in terms of its phonological effect. Section 3.5 is a conclusion.

3.2 The Original LA and Its Problem

Chomsky (2013, 2015) proposes LA to determine labels of SOs, which is illustrated in (1):

(1) Labeling Algorithm

a. $[_{\alpha}$ H XP] α = H

b. $[_{\alpha}$ XP YP] (i) [XP $[_{\alpha}$ XP YP]] α = YP

(ii) $[_{\alpha}$ $XP_{[F]}$ $YP_{[F]}$] α = <F, F>

H = Head, XP, YP = Phrase, F = Feature

Chomsky assumes that a label of an SO is determined by minimal search. When a head H and a phrase XP, are merged as in (1a), the former is selected as a label because it is the closest head from the top of the SO and located by minimal search. On the other hand, when two phrases, XP and YP, are merged as in (1b), a label of the SO cannot be determined uniquely because minimal search locates two heads, X and Y. This is called "XP-YP problem." In order to avoid this problem, Chomsky proposes two strategies. One is raising either XP or YP in (1bi): If one of the phrases raises to the outside of the minimal search domain for labeling, it becomes invisible to the labeling computation, and hence the other phrase serves as a label. This assumption is based on the idea that Internal Merge (IM) yields a discontinuous SO (chain), and it is the discontinuous element, but not each copy, that is visible for LA. The other strategy is building on a shared (agreement) feature in (1bii): If merged phrases are in an agreement relation, the agreement feature serves as a label <F, F>. Since phrasal movement always causes an XP-YP problem at its landing site, such a moving material must end up in the position where it takes part in <F, F> labeling.

According to the original LA, the labeling process takes place at the phase-level. Specifically, Chomsky (2015: 6) notes that "since the same labeling is required at C-I and for the processes of externalization (...), LA must apply at the phase level, as part of the Transfer operation." This assumption is natural if labels are required not for structure building within Narrow Syntax (cf. Chomsky (2005)) but for interpretation at interfaces. Following Chomsky, I assume that labeling takes place at the timing of Transfer.[1]

LA is very insightful and has many consequences, but some previous works have raised conceptual and empirical problems with it. Here, I show one of the problems, which is pointed out by Abe (2016): The original LA cannot determine a label of an

SO with IM from an agreement position. This case is problematic because some requirement for labeling contradicts another requirement for IM. Let us start with the former requirement.

Chomsky (2013, 2015) assumes that a subject and an object must take part in labeling in their agreement positions even if they further raise from there. This is because the heads of their merge-mates (T-head and root-head, respectively) are too weak to serve as a label by themselves, and the weak heads require an agree-mate in order to label an SO, as shown in (2).

(2) a. $[_{??}$ T vP]

b. $[\underline{_{<\varphi, \varphi>}}$ $[_{DP}$ subject$_{[\varphi]}]$ $[\underline{_{TP}}$ $T_{[\varphi]}$ vP]]

In (2a), a label of [T vP] cannot be determined even though it is a kind of [H XP] structures. This is because the T-head is too weak to serve as a label by itself. This problem is solved by adding T's agree-mate, as in (2b). Chomsky assumes that, if a subject DP is internally merged with [T vP], the T-head takes part in <φ, φ> labeling and this labeling allows the unlabeled SO to be labeled as TP by strengthening the T-head. Thus, labeling by a shared feature is necessary at a φ-agreement position.

However, if we strictly follow the original LA, the relevant labeling would fail once the subject copy raises from the position. Remember that raising an SO makes a resulting lower copy invisible to LA. This means that IM from agreement positions also makes resulting lower copies invisible to LA, and hence it is impossible to obtain <φ, φ> label, as schematized in (3).

(3) $[[_{DP}$ subject$]_i$ … $[_{??}$ [DP subject]$_i$ $T_{[\varphi]}$ vP]]

Since the unlabeled SO cannot be interpreted at interfaces, this is problematic.

To solve this problem, Chomsky assumes that raising from an agreement position takes place after <φ, φ> labeling. Specifically, he assumes the rule order in (4), which starts with raising of a subject DP *who* to an agreement position and ends with further IM from there.

(4) Who do you think read the book?

a. [C [$_{\alpha}$ who$_{[\varphi]}$ T [$_{vP}$ …]]]

→ Feature inheritance from C to T

b. [C [$_{\alpha}$ who$_{[\varphi]}$ T$_{[\varphi]][Tns][Phase]}$ [$_{vP}$ …]]]

→ **Labeling α as <φ, φ>** on the basis of agreement

c. [C [$_{<\varphi, \varphi>}$ who$_{[\varphi]}$ T$_{[\varphi]][Tns][Phase]}$ [$_{vP}$ …]]]

→ C-deletion

d. [~~C~~ [$_{<\varphi, \varphi>}$ who$_{[\varphi]}$ T$_{[\varphi]][Tns][Phase]}$ [$_{vP}$ …]]]

→ Transfer of vP triggered by the remaining phase-hood of T

e. [~~C~~ [$_{<\varphi, \varphi>}$ who$_{[\varphi]}$ T$_{[\varphi]][Tns][Phase]}$ [$_{vP}$ …]]]

→ **Further Raising of *who***

f. [who ... [~~C~~ [$_{<\varphi, \varphi>}$ who$_{[\varphi]}$ T$_{[\varphi]][Tns][Phase]}$ [$_{vP}$ …]]]]

Here, the subject DP takes part in labeling before it undergoes further IM. The IM is possible because of C-deletion: Since the phase-hood is activated on the T-head and Transfer applies to vP, the subject DP at the edge of the phase is still movable even after the Transfer.

However, the above rule order is inconsistent with the assumption that LA applies as part of the Transfer. This assumption naturally leads us to assume that

labeling at each phase is limited to its Transfer domain of the phase. Given this, it is clear that the subject DP cannot take part in labeling in (4c) because it is outside the Transfer domain. Then, <φ, φ> label ought to be obtained not by the Transfer of the CP (TP) phase but by that of the next higher phase, as illustrated in (5):

(5)

a. [∈ [α who$_{[\varphi]}$ T$_{[\varphi]][Tns][Phase]}$ [$_{vP}$ …]]] (Transfer)

b. [H … [∈ [$_{<\varphi, \varphi>}$ who$_{[\varphi]}$ T$_{[\varphi]][Tns][Phase]}$ [$_{vP}$ …]]] (Transfer)

In (5b), <φ, φ> label is obtained within the Transfer domain of HP.

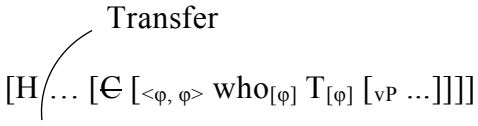
If derivation proceeds as shown in (5), we face a crucial problem with the original LA again. Notice that the relevant label is obtained only if the moving material is visible for labeling computation at the timing of labeling. Once a phrase XP undergoes IM, it is taken as a discontinuous SO by LA and minimal search for labeling finds it at the position where every occurrence of XP is contained (that is, the position of the head of a chain). This means that the DP in (5b) should not raise from the agreement position by the timing of labeling so that it is visible to minimal search for <φ, φ> labeling. However, this derivation has a problem regarding further raising: The DP cannot move out of the transferred domain after labeling because of the Phase Impenetrability Condition (PIC):[2]

(6) The Phase Impenetrability Condition

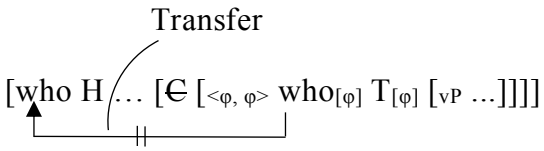
In phase α with head H, the domain of H is not accessible to operations outside α, only H and its edge are accessible to such operations.

Given the PIC, the derivation proceeds as follows:

(7) a. <φ, φ> labeling through Transfer



b. * IM of *who*



In (7a), labeling applies within the Transfer domain of the HP phase, and the *wh*-DP takes part in <φ, φ> labeling. However, after the labeling, the DP cannot be extracted out of the Transfer domain due to the PIC as in (7b). Hence, the original LA cannot allow any A'-movement from an agreement position.

Thus, the original LA does not work well in A'-movement environment. If an argument raises before labeling, a lower copy becomes invisible to LA. This is problematic because the copy is necessary to obtain <φ, φ> label. On the other hand, if labeling takes place before raising, an argument remains within the Transfer domain at the timing of labeling. Then, it cannot move from the position because a transferred expression cannot undergo further syntactic operation.[3]

In order to solve this problem, we have to consider that IM does not make lower copies invisible. That is, if we assume that LA targets not a discontinuous element (chain) but each copy (cf. Abe (2016), Emoto (2013), Mizuguchi (2019), Shim (2018) and others), lower copies in agreement positions can take part in <φ, φ> labeling even after IM from these positions. However, taking this strategy requires us to reconsider the "XP-YP problem" at each XP-YP structure without agreement, where one of the

phrases should be invisible to LA. That is, LA must distinguish copies in terms of their necessity for labeling. In the following section, I propose a new labeling mechanism so that labeling computation can distinguish necessary copies and unnecessary ones.

3.3 Proposal

Given the discussion in the previous section, some copies must be visible for labeling computation but others must not be: A copy which causes an XP-YP problem must be invisible to LA but a copy that is required for <F, F> labeling must be visible for LA. In order to achieve this goal, I propose to replace the labeling strategy (1bi) with the following:

(8) a. All copies are visible for LA.

b. A copy that causes an XP-YP problem is deleted before labeling, and a remaining phrase serves as a label.

The modification of LA indicates that it is not IM but the deletion that makes copies invisible to LA. This means that labeling computation can distinguish two kinds of copies in terms of whether they are deleted or not. The proposed analysis makes a copy which causes an XP-YP problem invisible by deleting it as in (9), in which the deleted material is expressed by strikethrough.

(9) Labeling by Copy Deletion

[XP [$_{\alpha}$ ~~XP~~ YP]] α = YP

This pattern applies to a base-generated copy of an external argument or an intermediate copy of A/A'-movement. In contrast, the current proposal does not delete copies taking part in <F, F> labeling so that they can be visible for LA as in (10).

(10) Labeling by a shared feature

[XP [$_{\alpha}$ $XP_{[F]}$ $YP_{[F]}$]] α = <F, F>

This pattern applies to copies at agreement positions.

Thus, the modification in (8) allows the desired copy distinction. Since deletion of copies helps determine labeling, I assume that this operation applies before application of LA/Transfer (i.e. within Narrow Syntax). Therefore, I call the operation "NS-Copy Deletion" from now on.

Now, let us show how the proposed analysis accounts for the problematic case for the original LA, that is, IM out of agreement positions. Given the Copy Deletion-based approach, IM applies first and then labeling takes place as illustrated in (11). Schematizing the derivation, I do not assume C-deletion, which is necessary for Chomsky's (2015) analysis of (4). This is because the proposed analysis does not have to resort to this operation. Therefore, *wh*-movement goes through the edge of the embedded CP-phase and leaves a copy there.

(11) Who do you think read the book?

a. IM from an agreement position

[who C [$_{\alpha}$ $who_{[\varphi]}$ $T_{[\varphi]}$ [$_{\beta}$ who v …]]]

b. NS-Copy Deletion

[who C [$_{\alpha}$ who$_{[\varphi]}$ T$_{[\varphi]}$ [$_{\beta}$ ~~who~~ v …]]]

c. Labeling at Transfer of the CP-phase

[who C [$_{<\varphi, \varphi>}$ who$_{[\varphi]}$ T$_{[\varphi]}$ [$_{vP}$ ~~who~~ v …]]]

The derivation from (11a) to (11c) contains three copies of *who* (the base-generated copy, the copy in its agreement position and the copy at the CP-edge). In (11a), IM can raise the subject to the phase-edge before Transfer. Then, in (11b), NS-Copy Deletion applies to the base-generated copy but not to the copy at the agreement position. (In addition, the copy at the phase-edge is not deleted at this stage, but it is deleted before the next Transfer.) Consequently, the latter copy can be input to LA and hence the <φ, φ> label is obtained in (11c).[4]

Thus, the Copy Deletion-based approach can not only yield the same labeling results as the original LA but also solve the problem with it. In this respect, the proposed LA is superior to the original one. In the remainder of this chapter, I provide various consequences of the proposal, focusing on phonological effects that reflect the result of the Copy Deletion.

3.4 Consequences

In the previous section, I have proposed that Copy Deletion applies within Narrow Syntax so that labeling computation can avoid XP-YP problems. As a consequence of deletion before Transfer, the current proposal predicts that copies deleted by NS-Copy Deletion cannot be input into PF/LF interfaces. In this section, I will present various empirical facts showing that the proposed deletion affects some phonological effects at PF-interface.

Let us start by considering the derivation with NS-Copy Deletion. First, suppose that two phrases form an XP-YP structure and either of them raises from it. Then, a resulting lower copy is deleted within Narrow Syntax and hence the remaining phrase becomes the label of the XP-YP structure. Last, Transfer sends the relevant SO to interfaces so that it is interpreted. Notice that the deleted copy cannot be mapped into the phonological and semantic component since it is lost before being sent to the components. Consequently, my proposal predicts that such an early deleted copy cannot have any phonological/semantic effect.[5] I schematize this derivation in (12), where each copy of XP is numbered just for the expository purpose.

(12) Narrow Syntax Application of LA PF/LF

$XP^1 \ldots [_{??}\ XP^2, YP] \rightarrow XP^1 \ldots [_{YP}\ \sout{XP^2}, YP] \Rightarrow XP^1 \ldots YP$

Next, consider the derivation with labeling on the basis of a shared feature. In contrast to the above case, copies required for labeling must not be deleted within Narrow Syntax so that they can be visible for labeling. Consequently, such undeleted SOs can be input into interfaces as phonologically/semantically interpretable elements. Therefore, my proposal predicts that these copies have some phonological/semantic effects, as schematized in (13).

(13) Narrow Syntax Application of LA PF/LF

$XP^1 \ldots [_{??}\ XP^2_{[F]}, YP_{[F]}] \rightarrow XP^1 \ldots [_{<F, F>}\ XP^2_{[F]}, YP_{[F]}] \Rightarrow XP^1 \ldots XP^2\ YP$

Thus, the current proposal predicts that two kinds of copies differ in their interpretability at interfaces: Copies which are not required for labeling cannot be

interpretable while those which are required for labeling are read off at interfaces. The proposed analysis can be corroborated by showing distinctions between the two kinds of copies in their phonological/semantic effect. In the remainder of this chapter, I mainly explore various phonological effects, and present the evidence that supports the Copy Deletion-based LA.

Before looking at specific phonological effects, I have to explain why lower copies at agreement positions cannot be pronounced even though they are required for <φ, φ> labeling. For illustration, consider the following *wh*-interrogative sentence.

(14) a. who do you think t_{who} is a genius?

b. [$_{<Q, Q>}$ who^1 do you think C [$_{<\varphi, \varphi>}$ who^2 T-is a genius]]

c. *who^1 do you think who^2 is a genius

In the schema of (14b), two *wh*-copies are required for labeling, *who^1* participating in <Q, Q> labeling and *who^2* taking part in <φ, φ> labeling, and therefore the two copies are sent to the phonological component and interpreted there. Nevertheless, the *wh*-copy *who^1* is superficially realized but *who^2* is not, as shown in (14a). If every copy taking part in <F, F> label is phonologically realized, my proposal would predict the pronunciation in (14c). However, it is completely disallowed. (In fact, the auxiliary *do* and copular *is* also have multiple copies, but I omit their lower copies to simplify the current discussion.) The restriction on copy realization of *who^2* poses a problem of why this copy is not pronounced despite being sent to the PF-interface.

With respect to this mismatch, I assume that lower copy deletion is applied in the phonological component to obey the phonological conditions on linear orders that are proposed in Nunes (2004, 2011).

(15) The Irreflexivity Condition

If α precedes β, then it must be the case that α ≠ β.

(16) The Asymmetry Condition

If α precedes β, then it must be the case that β does not precede α.

(Nunes (2004: 24))

Nunes argues that linear orders have to obey these conditions, and that Copy Deletion applies in the phonological component in order not to violate the conditions. Following him, I give sentence (14a) the following phonological derivation: First, the proposed Copy Deletion system provides the representation of (17a), which violates the two conditions on linear orders, as illustrated in (17b, c).

(17) a. *who[1] do you think who[2] is a genius (=(14c))

b. who[1] » who[2], who[1] = who[2] → *the irreflexivity condition

c. who[1] » do you think » who[2] → *the asymmetry condition

The representation of (17a) violates the irreflexivity condition since *who[1]* precedes *who[2]* but they are non-distinct in (17b). In addition, the representation also violates the asymmetry condition since the wh-copy *who[1]* precedes the sequence of *do you think* but the sequence in turn precedes the other wh-copy *who[2]*, which is not distinct from *who[1]* in (17c). In order to avoid such violations, Copy Deletion must be applied to *who[2]* in the phonological component.[6] In this chapter, I name the deletion applied in the phonological component "PF-Copy Deletion." As a consequence of this operation, the *wh*-question can obtain the legitimate linear order that includes only one *wh*-copy.[7] Assuming this kind of derivation, copies taking part in <φ, φ>

labeling are mapped into the phonological component but deleted at a later stage in A'-movement environment.

Summarizing the above discussion, I propose the following rule order.

(18) Rule Order regarding Copy Deletion

(i) NS-Copy Deletion (Narrow Syntax) ⇒ no phonological effects

(ii) Application of LA (Transfer)

(iii) PF-Copy Deletion (Phonological component) ⇒ phonological effects

(18) indicates that Copy Deletion may apply once (or twice if necessary) and that their timings are regulated by LA as part of the Transfer: The first application is before LA and the second is after that.

The distinction is reflected as the presence or absence of phonological effects. Concretely, if a copy undergoes NS-Copy Deletion, it cannot have any phonological effect because it is lost before Transfer. In contrast, if a copy is not deleted within Narrow Syntax for labeling, it has some phonological effect by being sent to the phonological component. Among the latter copies, some are deleted in the phonological component, but I assume that they also have some phonological effect before PF-Copy Deletion.

In the following sections, I will present some empirical evidence which suggests the copy distinction the current proposal predicts. More specifically, I will show the distribution of various phonological phenomena such as contraction, exceptional copy realization, VP-ellipsis standing an infinitive marker and cliticization of an infinitive auxiliary.

3.4.1 Contraction

In the literature, some previous works on contraction attempt to explain its distribution by appealing to interaction between the contraction process and some silent elements such as silent copies (or what was analyzed as *trace*). Contraction is a sandhi phenomenon where a word is reduced and affixed to another word, and it has been sometimes suggested that this is affected by silent copies in certain circumstances. To illustrate this, let us see an example of *wanna*-contraction. In (19), an infinitive marker *to* is reduced and affixed to an adjacent overt material *want* to form a contracted word *wanna*.

(19) I want to/wanna meet John.

In the simple control sentence, contraction is allowed. In contrast, the *wanna*-contraction is blocked when *want* and t*o* are separated by a silent copy of an embedded subject, as illustrated by sentence (20a) with its rough syntactic structure (20b).

(20) a. Who do you want to/*wanna meet John?

b. who do you want <u>who</u> to meet John

The prohibition of the contraction in (20a) is sometimes taken to suggest that the silent *wh*-copy disturbs contraction by intervening between *want* and *to* at the phonological component. However, not all silent elements seem to have the same effect. For instance, in the simple control sentence in (19), *want* and *to* are in fact separated by silent elements such as a PRO subject and an empty C-head, as schematized in (21).

(21) I want C PRO T-to who meet John

However, these elements do not block contraction unlike the *wh*-subject copy. In addition, a different kind of *wh*-copy does not disturb contraction either, as illustrated in a question with a *wh*-object in (22). Here *wh*-movement leaves a copy at the edge of the embedded CP-phase.

(22) a. Who do you want to/wanna meet?

b. who do you want who C PRO to meet who

The difference given above suggests that silent elements differ in their phonological properties.

In the literature, many analyses have been proposed in order to explain the difference among the above sentences. Here, I review a famous phonological approach to the fact proposed by Jaeggli (1980).[8, 9] He proposes (i) that *wanna*-contraction requires the PF-adjacency between *want* and *to*, and (ii) that Case-marked elements block the adjacency while Case-less elements do not. This approach gives the sentences in (19, 20a) the following structures.

(23) a. I want $PRO_{[-Case]}$ to meet John: want ($PRO_{[-Case]}$) to

b. who do you want $who_{[+Case]}$ to meet John: want $who_{[+Case]}$ to

In (23a), the PRO subject intervenes between *want* and *to*. However, the Case-less element does not block the PF-adjacency between the two words, and hence contraction is allowed. On the other hand, in (23b), the Case-marked *wh*-copy

intervenes between *want* and *to*. The Case-assigned copy blocks the PF-adjacency between *want* and *to*, and therefore *wanna*-contraction is prohibited.

Thus, Jaeggli's approach distinguishes two kinds of silent elements with regards to their Case property. However, I think that the analysis is insufficient at least in three respects. First, it is unclear why and how Case-marking causes the relevant phonological effect within the Minimalist framework. Without explanation for this, Jaeggli's account is merely descriptive. Second, PRO subjects have been recently analyzed as null-Case (or ordinary Case)-marked elements (cf. Chomsky and Lasnik (1993) and Martin (1996, 2001), Landau (2004, 2006b, 2008) and others). If this is on the right track, the Case-based approach cannot distinguish PRO subjects from lexical subjects and excludes both (23a) and (23b). Third, this approach incorrectly predicts that contraction is disturbed in a *wh*-question in (22), whose structure is schematized in (24): This sentence contains a Case-assigned *wh*-copy at the edge of the embedded CP-phase, and the Case-based approach incorrectly predicts that the copy blocks contraction by interrupting the PF-adjacency between *want* and *to*.

(24) who do you want [$_{CP}$ who$_{[+Case]}$ C PRO to meet who$_{[+Case]}$]

Thus, Jaeggli's approach is insufficient conceptually and empirically.

On the other hand, my analysis correctly predicts the distribution of *wanna*-contraction. The current proposal distinguishes copies in terms of application of (NS-)Copy Deletion: Some copies have phonological effect because they are not deleted up to PF-interface, while other copies do not because they are deleted before Transfer. According to this distinction, we can explain the distribution of contraction if the former copies phonologically disturbs contraction while the latter copies do not

affect the phenomenon.

Before presenting my analysis, I first assume with Ackema and Neeleman (2003), Sato (2012) and Thoms and Sailor (2017) that contraction applies at the early stage of the phonological component (immediately after Transfer or at least before PF-Copy Deletion). Then, this sandhi phenomenon might be affected by some materials mapped onto a phonological representation even if they are deleted at a later stage. Specifically, contraction fails if a phonologically mapped copy blocks a required adjacency relation in the linear order before PF-Copy Deletion. On the other hand, contraction succeeds if a potentially interrupting copy is not mapped into the phonological component due to NS-Copy Deletion.

Now, let us move on to my analysis. First, I analyze the simple control construction. Sentence (19), repeated here as (25a), has the structure of (25b). In analyzing this sentence, I assume with Epstein, Kitahara and Seely (2016) that a clause-selecting verb *want* is formed by External Pair-Merge of a v-head with a root √*want*.

(25) a. I want to/wanna meet John

b. [$_{CP}$ C [$_{<\varphi,\ \varphi>}$ $I_{[\varphi]}$ $T_{[\varphi]}$ [$_{vP}$ ~~I~~ <√want, v> [$_{CP}$ C [$_{<\varphi,\ \varphi>}$ $PRO_{[\varphi]}$ $T_{[\varphi]}$-to [$_{vP}$ ~~PRO~~ <√meet, v> [$_{<\varphi,\ \varphi>}$ √$meet_{[\varphi]}$ $John_{[\varphi]}$]]]]]]]

Under the current proposal, the base-generated copy of each external argument is deleted within Narrow Syntax so that labeling computation can avoid XP-YP problems. On the other hand, the lower copy of √*meet* is not deleted because it is required for <φ, φ> labeling.[10] At this stage, *want* and *to* are separated by the C-head and the PRO subject. Here, I assume that these interrupting elements are

inherently null, and hence they are not mapped into the phonological component. As a result, structure of (25b) is mapped onto the linear order of (26).

(26) I want to meet meet John

Since *want* and *to* are adjacent, contraction is applicable here.

Second, consider the ungrammatical case of *wanna*-contraction, which involves *wh*-movement of an embedded subject. In analyzing this kind of construction, I adopt Martin's (1996, 2001) assumption that the *wh*-subject receives Case within the embedded clause. From the perspective of labeling, this means that the subject takes part in φ-agreement and succeeding <φ, φ> labeling. Then, sentence (27a) has the structure of (27b) and the linear order of (27c). In (27b), I assume that the lexical subject agrees with the embedded T-head.

(27) a. Who do you want to/*wanna meet John?

b. [$_{<Q,\ Q>}$ who$_{[Q]}$ C$_{[Q]}$-T-do [$_{<\varphi,\ \varphi>}$ you$_{[\varphi]}$ T$_{[\varphi]}$-do [$_{vP}$ ~~who~~ ~~you~~ <√want, v> [$_{CP}$ ~~who~~ C [$_{<\varphi,\ \varphi>}$ who$_{[\varphi]}$ T$_{[\varphi]}$-to [$_{vP}$ ~~who~~ <√meet, v> [$_{<\varphi,\ \varphi>}$ √meet$_{[\varphi]}$ John$_{[\varphi]}$]]]]]]]

c. who do you do want who to meet meet John

In (27b), the *wh*-copy taking part in <φ, φ> labeling cannot be deleted within Narrow Syntax. Consequently, the relevant copy intervenes between *want* and *to* in the representation of (27c), and hence blocks *wanna*-contraction.

Last, let us move on to the case of *wanna*-contraction with IM of a *wh*-object. Sentence (28a) has the structure of (28b) and the linear order of (28c).

(28) a. Who do you want to/wanna meet?

b. [$_{<Q, Q>}$ who$_{[Q]}$ C$_{[Q]}$-T-do [$_{<\varphi, \varphi>}$ you$_{[\varphi]}$ T$_{[\varphi]}$-do [$_{vP}$ ~~who~~ ~~you~~ <√want, v> [$_{CP}$ ~~who~~ C [$_{<\varphi, \varphi>}$ PRO$_{[\varphi]}$ T$_{[\varphi]}$-to [$_{vP}$ ~~who~~ ~~PRO~~ <√meet, v> [$_{<\varphi, \varphi>}$ √meet$_{[\varphi]}$ who$_{[\varphi]}$]]]]]]]

c. who do you do want to meet meet who

Since the intermediate *wh*-copies are all deleted before Transfer, they are not mapped into the phonological component. As a result, *want* and *to* are adjacent in the phonological component, and hence contraction is possible.

Before closing this subsection, let us turn to the contraction in raising constructions that is taken to suggest that a copy of A-movement does not block contraction. In analyzing this construction, I adopt Mizuguchi's (2016) proposal that the T-head of an embedded clause is introduced with externally pair-merged C-head. This assumption is necessary for labeling within the embedded clause. An English T-head is generally assumed to require <φ, φ> labeling since it is too weak to serve as a label by itself. However, a T-head within an embedded clause of a raising construction cannot take part in <φ, φ> labeling because it does not agree with anything. Therefore, I assume that a <T, C> amalgam serves as a label in this environment, just as a <root, v> amalgam does so in vP. Then, sentence (29a) has the structure of (29b) and the linear order of (29c).

(29) a. John seemsta like pickles.

b. [$_{CP}$ C [$_{<\varphi, \varphi>}$ John$_{[\varphi]}$ T$_{[\varphi]}$ [$_{vP}$ ~~John~~ <√seem, v> [$_{<T, C>P}$ ~~John~~ <T, C>-to [$_{vP}$ ~~John~~ <√like, v> [$_{<\varphi, \varphi>}$ √like$_{[\varphi]}$ pickles$_{[\varphi]}$]]]]]]

c. John seem to like like pickles

In (29b), a copy of *John* is merged with the phrase headed by the <T, C>-head. Since <φ, φ> labeling is unavailable at this position, we must rely on the other solution to an XP-YP problem: NS-Copy Deletion. That is, in the embedded clause of the raising construction, the relevant copy is deleted within Narrow Syntax (and the remaining phrase (the SO headed by <T, C>) serves as a label). As a result of the NS-Copy Deletion, *seem(s)* and *to* are adjacent in the mapped linear order, and thus *to*-contraction is allowed.

3.4.2 Lower Copy Realization

Within the Minimalist Program, displacement is analyzed under the Copy Theory of Movement, which assumes that movement (IM) leaves behind copies of the moving materials (not traces of them, as assumed under the Trace Theory of Movement). Movement forms a discontinuous SO (what is called "chain") composed of the created copies, and they are mapped into the phonological component and the semantic component. However, not all the copies are interpreted at interfaces. In the phonological side, typically only the highest copy is realized but the others are not. On the other hand, in the semantic side, the copy of an operator position and that of an argument position are interpreted while intermediate ones are typically deleted. In addition to the typical cases, we can also observe many exceptional cases. This kind of variety leads us to wonder which copies are selected for interpretation at interfaces and why and how they are selected. In this subsection, I focus on the phonological side of the question, and explain restriction on some exceptional copy realization.

Let us see the canonical copy realization pattern. In the case of the English *wh*-movement, the structurally highest and the linearly leftmost copy is typically realized.

As an example of *wh*-question, consider the sentence in (30a), whose syntactic structure is schematized in (30b). In the schema, each copy is numbered just for the expository purpose.

(30) a. What do you like?

b. [what[1] C [you T [what[2] you <√like, v> [√like what[3]]]]]

In (30b), there are three copies of the *wh*-object: the base-generated copy *what*^{3}, the intermediate one *what*^{2} and the one at the landing site *what*^{1}. Among these copies, *what*^{1} is pronounced while the others are deleted.

On the other hand, some exceptional copy realization has also been observed in many languages. For instance, Franks (1998), Bošković (2002) and many others point out that a lower copy can be realized if some phonological factor prevents pronunciation of the structurally highest copy. Examples of such exception come from various multiple *wh*-fronting languages. To set the stage for the discussion, I first introduce run-of-the-mill *wh*-questions in Bulgarian (31) and Romanian (32).

(31) a. Koj kakvo e kupil? (Bulgarian)
who what is bought
‘ Who bought what?’

b. *Koj e kupil kakvo?

(32) a. Cine ce a spus? (Romanian)
who what has said
‘ Who said what?’

b. *Cine a spus ce?

In these sentences, all *wh*-phrases must be fronted, as in (31a) and (32a). If a *wh*-phrase is realized at another position, the *wh*-questions are ungrammatical as in (31b) and (32b). An important factor of the multiple fronting is that these *wh*-phrases are different words (the counterparts of 'who' and 'what'). In contrast, if multiple *wh*-phrases are homophonous, a different realization pattern appears as in (33) and (34).

(33) a. Kakvo obuslavlja kakvo (Bulgarian)
who conditions what
' What conditions what?'
b. *Kakvo kakvo obuslavlja?

(34) a. Ce precede ce? (Romanian)
what precedes what
' What precedes what?'
b. *Ce ce precede?

In (33a) and (34a), one of the homophonous *wh*-phrase can be realized not at the fronted position but at the object position. In contrast, sentences in (33b) and (34b) show that it is impossible to pronounce all the *wh*-phrases at the sentence-initial positions. Thus, multiple *wh*-questions with homophonous *wh*-phrases show the exceptional lower copy realization.[11]

To capture this fact, Bošković (2002) proposes the following phonological constraint on PF-representations:

(35) Avoid homophonous sequence.

This constraint prevents the multiple *wh*-questions in (33) and (34) from containing consecutive homophonous strings (such as *kakvo-kakvo* and *ce-ce*), and forces the lower copy realization in order to avoid such illegitimate sequences.

Thus, the phonological constraint (35) explains the attested copy realization pattern in question. However, it is insufficient to explain some restriction on lower copy realization. Concretely, if one of homophonous *wh*-phrases is not realized at the highest position, copy is realized in agreement positions but not in intermediate positions. In the following examples, I roughly schematize *wh*-movement constructions, and use the symbol "%" to mark variation on judgment.

(36) Kakvo (*kakvo) misli Ivan (%kakvo) če (kakvo) obuslavlja
what what thinks Ivan what that what conditions
(kakvo)?
what
' What does Ivan think conditions what?'

(37) Ce (*ce) crede Ion (*ce) că (%ce) a determinat
what what thinks Ion what that what has determined
(ce)?
what
' What does Ion think determined what?' (ibid.: 373)

These sentences show that one of the homophonous *wh*-phrases is realized in the sentence-initial position and the other is pronounced in the subject position or the object position. The point here is that lower copy realization is not licensed at the intermediate positions. This restriction on the lower copy realization is not captured

by the constraint proposed by Bošković: It does nothing other than prohibiting a homophonous sequence, and hence it does not prevent other copy realization. Therefore, if lower copy realization is required in order to avoid a homophonous sequence, then intermediate copies should also be candidates for the copy realization. Since it is unclear why intermediate copies cannot be realized, this problem needs an independent explanation.

The problem is solved by the Copy Deletion-based labeling mechanism, under which some copies are sent to PF-interface and interpreted there while others are not transferred to the component since they are deleted before Transfer. Given this, the former copies can be potentially pronounced (though some of them are deleted at PF in order to obtain legitimate linear orders), but the latter copies cannot. Consider the structure of (36) and (37), which are illustrated in (38) and (39) respectively.

(38) [kakvo kakvo misli Ivan [$_{CP}$ ~~kakvo~~ C-če [$_{<\varphi,\ \varphi>}$ kakvo$_{[\varphi]}$ T$_{[\varphi]}$ [$_{vP}$ <√obuslavlja, v> [$_{<\varphi,\ \varphi>}$ √obuslavlja$_{[\varphi]}$ kakvo$_{[\varphi]}$]]]]

(39) [ce ce crede Ion [$_{CP}$ ~~ce~~ C-că [$_{<\varphi,\ \varphi>}$ ce$_{[\varphi]}$ T$_{[\varphi]}$-a [$_{vP}$ <√determinat, v> [$_{<\varphi,\ \varphi>}$ √determinat$_{[\varphi]}$ ce$_{[\varphi]}$]]]]]

Analyzing the structures in a similar way to English, we can see that intermediate copies cannot be realized because they are deleted before Transfer. On the other hand, copies taking part in <φ, φ> labeling can be pronounced because they are sent to the phonological component and interpreted there. Thus, my proposal straightforwardly explains the exceptional copy realization (and deletion) patterns, according to which lower copy realization is limited to agreement positions (and intermediate copies can never be pronounced).

3.4.3 *To*-Stranding VP-Ellipsis

English allows VP-Ellipsis (VPE) in infinitival clauses. VPE can apply in a complement clause of a raising predicate as in (40a) and in a complement clause of a control predicate as in (40b).

(40) a. They say that Mary doesn't know French, but she seems to.

(Wurmbrand (2005: 14))

b. Kim isn't sure she can solve the problem, but she will try to.

(Martin (2001: 154))

In contrast, ECM verbs block VPE in its infinitival complement clause, as exemplified below (cf. Emoto (2007)):[12]

(41) *I consider Pam to like soccer, and I believe Rebecca to as well. (ibid.)

These observations pose a question of why only ECM verbs prohibit VPE in their complement clauses. In this subsection, I address this question.

To set the stage for my analysis, I first introduce a phonological analysis of VPE proposed by Zwicky (1982), which will be discussed in more detail in chapter 4. For his analysis, the infinitive marker *to* is phonologically too weak and basically requires a prosodic host on its right in order to form a legitimate phonological unit. However, if VPE removes a phonological material on the right side of the infinitive marker, the phonologically weak element in turn requires its prosodic host on its left side. This is formulated as the condition in (42).

(42) *To* Reattachment (Zwicky (1982: 29))

When it does not form a VP constituent with an immediately following VP, the English infinitive marker *to* attaches to the constituent immediately to its left, to form a phonological phrase with it.

Building on the condition, Zwicky attributes the grammaticality of VPE in infinitival clauses to the phonological legitimacy of remnants of the ellipsis. More specifically, he proposes that VPE is allowed if the stranded infinitive marker finds its host on its left, but otherwise the ellipsis is prevented.

Now, we are ready to analyze VPE in infinitival clauses. First, consider the case of VPE in a raising construction. As assumed in section 3.4.1, a clause-selecting verb is formed by External Pair-Merge of v-head with a root, and the T-head of an embedded clause in a raising construction is introduced with an externally Pair-Merged C-head. Then, (43a) has the structure in (43b), where the elided part is marked by double lines, and the phonological derivation of (43c).[13] Here, I show two phonological representations that are obtained before and after PF-Copy Deletion, (though these representations are the same because they do not contain any copy to be deleted at the phonological component).

(43) a. They say that Mary doesn't know French, but she seems to.

b .... but [$_{<\varphi,\ \varphi>}$ she$_{[\varphi]}$ T$_{[\varphi]}$ [$_{vP}$ ~~she~~ <√seem-v> [$_{<T,\ C>P}$ ~~she~~ <T, C>-to [$_{vP}$ ~~she <√know, v> [$_{<\varphi,\ \varphi>}$ √know$_{[\varphi]}$ French$_{[\varphi]}$~~]]]]]

c. … but she seems to → PF-Copy Deletion

⇒ … but she seems to

In the first linear order of (43c), the infinitive marker directly follows the raising verb. The phonologically weak word can depend on the prosodic host on its left, and the dependency is maintained even after PF-Copy Deletion. Since the ellipsis remnant is phonologically licensed, VPE is allowed in this construction.

Next, let us turn to the case of control verbs:

(44) a. Kim isn't sure she can solve the problem, but she will try to.

b .... but [$_{<\varphi, \varphi>}$ she$_{[\varphi]}$ T$_{[\varphi]}$-will [$_{vP}$ ~~she~~ <√try-v> [$_{CP}$ C [$_{<\varphi, \varphi>}$ PRO$_{[\varphi]}$ T$_{[\varphi]}$-to [$_{vP}$ ~~PRO~~ ~~<√solve, v> [$_{<\varphi, \varphi>}$ √solve$_{[\varphi]}$ the problem$_{[\varphi]}$~~]]]]]]

c. … but she will try to → PF-Copy Deletion

⇒ … but she will try to

In (44c), the C-head and PRO subject are not mapped into the phonological component since they are inherently null elements. As a result, the infinitive marker is adjacent to the control verb in the phonological representation. The required dependency relation can be established with the control predicate and it is maintained to the end. Therefore, this sentence is phonologically legitimate and VPE is licensed.

Finally, let us move on to the case of ECM verbs. In analyzing ECM construction, I assume with Chomsky (2013, 2015) that this construction involves raising-to-object.

(45) a. *I consider Pam to like soccer, and I believe Rebecca to as well.

b .... and I [$_{vP}$ ~~I~~ <√believe-v> [$_{<\varphi, \varphi>}$ Rebecca$_{[\varphi]}$ √believe$_{[\varphi]}$ [$_{<T, C>P}$ ~~Rebecca~~ <T, C>-to [$_{vP}$ ~~Rebecca~~ ~~<√like, v> [$_{<\varphi, \varphi>}$ √like$_{[\varphi]}$ soccer$_{[\varphi]}$~~] as well]]]]…

c. … and I believe Rebecca believe to as well → PF-Copy Deletion

⇒ … and I believe Rebecca ~~believe~~ to as well

Here, two copies of √*believe* are mapped into the phonological component. Since the infinitive marker directly follows the lower root copy in the first phonological representation, the phonologically weak word *to* depends on the root copy. However, the prosodic host is deleted by PF-Copy Deletion at a later stage, and the established phonological dependency is destructed. Since the infinitive marker finally loses its prosodic host in the phonological component, VPE is impossible in ECM complement clauses.

3.4.4 Auxiliary Reduction

In the previous section, I have shown that the current proposal explains that some phonological phenomenon is restricted because a required phonological relation is destructed through the phonological derivation. This subsection shows the same kind of restriction regarding auxiliary reduction. The discussion here leads us to conclude that the current analysis applies not only to A/A'-movement environments but also to head-movement environments. Consider examples (46), which involves cliticization of a reduced auxiliary.

(46) a. John should've left.

b. Should you have/*'ve hit Harry? (Lakoff (1970: 632))

Lakoff (1970) suggests that a reduced infinitival auxiliary verb (*'ve*) must cliticize onto a prosodic host on its left. Then, he shows that auxiliary reduction is impossible

in T-to-C movement environment where the reduced auxiliary is preceded by a silent element (or what was analyzed as *trace*).[14] The contrast in (46) can be captured by my proposal. Let us begin with (46a), which has the structure of (47a) and the linear order of (47b).

(47) a. [$_{CP}$ C [$_{<\varphi,\ \varphi>}$ you$_{[\varphi]}$ T$_{[\varphi]}$-should have [$_{vP}$ ~~you~~ <√hit, v> [$_{<\varphi,\ \varphi>}$ √hit$_{[\varphi]}$ Harry$_{[\varphi]}$]]]]

b. you should have hit hit Harry → PF-Copy Deletion

→ you should have hit ~~hit~~ Harry

In (47b), the infinitival auxiliary can phonologically depend on the finite auxiliary, and the dependency is maintained to the end. Therefore, the cliticization is phonologically licensed. Next, consider sentence (46b), which has the structure of (48a) and the linear order of (48b).

(48) a. [$_{CP}$ C-T-should [$_{<\varphi,\ \varphi>}$ you$_{[\varphi]}$ T$_{[\varphi]}$-should have [$_{vP}$ ~~you~~ <√hit, v> [$_{<\varphi,\ \varphi>}$ √hit$_{[\varphi]}$ Harry$_{[\varphi]}$]]]]

b. should you should have hit hit Harry → PF-Copy Deletion

→ should you ~~should~~ have hit ~~hit~~ Harry

The lower copy of *should* cannot undergo NS-Copy Deletion in (48a): If it is deleted before labeling, it is impossible to obtain <φ, φ> label because one of the agree-mate becomes invisible to labeling computation. As a result, the reduced auxiliary first criticizes onto the lower copy in the phonological component. However, the established dependency relation is destructed at a later stage through PF-Copy

Deletion. Since the reduced auxiliary finally loses its prosodic host, cliticization is prohibited.

3.5 Conclusion

In this chapter, I have proposed a modified LA that is based on Copy Deletion, and shown its consequences from the phonological perspectives. My discussion has started by pointing out that Chomsky's original LA is problematic in labeling in A'-movement environments. Given that lower copies are invisible to LA, labeling faces a problem in that arguments cannot take part in <φ, φ> labeling in their agreement positions after A'-movement. Chomsky (2015) proposes that <φ, φ> labeling applies before A'-movement, but this rule order is impossible if labeling applies as part of the Transfer, as Chomsky himself assumes: Once an argument takes part in <φ, φ> labeling at the timing of Transfer, it cannot move further because PIC prevents movement of the transferred SO.

In order to solve this problem, I have proposed that XP-YP structures can be labeled by deleting either phrase, and replaced raising-based labeling with the Copy Deletion-based labeling. I assume that the deletion operation applies before Transfer (within Narrow Syntax) so that it can help determine labels, calling it "NS-Copy Deletion." Given the proposal, <φ, φ> label can be obtained even after A'-movement if an argument copy is not deleted before labeling. The proposed labeling mechanism distinguishes two kinds of copies (and their phonological effects): Copies which cause a labeling problem are deleted before Transfer and hence have no phonological effect, while those which are required for labeling are not deleted at the same timing and hence have some phonological effects after Transfer. The proposed Copy Deletion mechanism predicts the presence or absence of the phonological effects

at a certain position, and I have explained the distribution of various phonological phenomena. Although this chapter has analyzed only phonological effects, the present analysis can also be extended to some semantic effects. I leave this topic for future research.[15]

Notes to Chapter 3

* This chapter is a revised version of Saito (2019b).

1. Some previous works assume different timings of labeling. For example, Rizzi (2015, 2016) assumes that labeling applies as soon as it can in accordance with Pesetsky's Earliness Principle (see Pesetsky and Torrego (2001: 400)). He proposes that certain labeling status prevents IM from criterial positions, and therefore the relevant labels must be determined before the prevented operations. In contrast, Bošković (2016) assumes that a label of a [H XP] structure is determined as soon as it can while that of a [XP YP] structure is determined at the phase-level. He attempts to explain the difference between [H XP] structures and [XP YP] structures in the extractability from them, and proposes that IM is possible out of labeled structures but impossible from unlabeled ones. Their analyses and Chomsky's original LA are very insightful but their arguments about the timing of labeling are not strong enough to defeat others' assumptions. Thus, there is no consensus about the timing of labeling within the current studies. Putting aside detailed discussion about the timing, I simply follow Chomsky's original assumption in this chapter.

2. In chapter 2, I have proposed a modified PIC. However, I show the original one in (6) because the difference between the two versions is not crucial for my discussion.

3. Bošković (2016) points out that the same kind of problem holds for Chomsky's (2015) analysis of labeling SOs with head-movement. In his analysis, root-to-v head

movement takes place within Narrow syntax. On the other hand, he assumes that the lower copy of the root takes part in<φ, φ> labeling through agreement with an object. If the head-movement applies before labeling, a lower head copy is invisible for LA and cannot participate in <φ, φ> labeling. Thus, labeling might fail in this environment, too.

4. One might consider the possibility that NS-Copy Deletion also applies to the copy at the agreement position. However, I eliminate this possibility because the resulting SO cannot be labeled due to the weakness of T: T is too weak too serve as a label. Thus, I assume that copies of arguments at their agreement positions must participate in <φ, φ> labeling whether or not they raise from the agreement positions.

5. One might think that the NS-Copy Deletion approach cannot capture the semantic interpretation of intermediate copies. For example, sentence (i) has anaphor binding interpretation which requires a *wh*-copy with an anaphor to be interpreted at an intermediate position.

(i) a. Which picture of himself$_i$ did John$_i$ think Mary likes?

b. [which picture of himself] did **John** think [which picture of **himself**]

anaphor binding

Mary likes [which picture of himself]

A possible solution to this problem is that the anaphor binding is licensed not within the semantic component, but within Narrow Syntax, and hence it does not require an intermediate copy in a LF representation (see Hicks (2008) and references therein).

I leave for future research how far this solution holds.

6. I assume that this deletion has to take place not within Narrow Syntax. This is motivated by the current studies such as Chomsky (2013) and Chomsky et al. (2019), which assume that Narrow Syntax does not contain any information about externalization. This means that the illegitimacy of a linear order is recognized not in Narrow Syntax but in the phonological component, and that the Copy Deletion to repair the phonological illegitimacy applies in the latter component.

7. One might wonder how to determine which copy is realized and which is deleted. The question has been one of the main issues in the literature of Copy Deletion and many analyses have been proposed. For example, Nunes (2004, 2011) proposes that a copy is realized at a feature-checking/valuation position where all uninterpretable features are checked/valued. Given this, a moving material is pronounced at the finally landing site. Besides, Bobaljik (2002) and Bobaljik and Wurumbrand (2012) propose that semantically interpreted copies and phonologically realized ones should be matched if possible. According to this, a wh-element is pronounced at the landing site because it is also the scope-taking position. Furthermore, Landau (2006a) proposes that copies are realized where they satisfy a PF requirement. For example, he regards the EPP requirement as a PF requirement, and explains the distribution of pronunciation. I do not take a particular approach in this thesis. However, following these previous studies, I simply assume that the structurally highest copy is pronounced in English *wh*-movement.

8. Besides Jaeggli's (1980) Case-based approach, many analyses have been

proposed to explain conditions on contraction and its distribution: the government-based approach by Aoun and Lightfoot (1984), Lobeck and Kaisse (1984), Bouchard (1986) and others, and the Multiple Spell-Out-based approach by Sato (2012), and the subcategorization-based approach by Bolinger (1981), Brame (1984), Sag and Fodor (1994) and Pullm (1997). Each of these previous approaches has its advantages, and hence it is too difficult to determine which is the best one. Hence, I put aside comparison of these approaches in this thesis. However, I try to show that the Case-based approach is not unreasonable as a first approximation by pointing out shortcomings of other approaches.

The government-based approach and Spell-Out-based approach propose that contraction is possible if a control complement clause is not a CP (or a phase) but a TP (or a non-phase). This assumption does not have any strong empirical evidence. In addition, previous studies argue that a complement clause of *want* forms a CP because it is movable unlike a TP complement clause.

(i) a. ?It was to win the race that we wanted.
b. *It seems to be winning the race that she seemed. (O'Flynn (2008: 19))

Want allows *wanna*-contraction with a following infinitive marker, as we have seen thus far. Therefore, the data suggests that a predicate can allow contraction even though its complement clause forms a CP.

The subcategorization-based approach assumes an independent lexical item *wanna*, which takes a bare infinitive but does not select clausal complement with an overt subject. However, Goodall (2017) notes that *wanna* behaves differently from other predicates that take a bare infinitive in that the former allows fronting of the

bare infinitive while the latter prohibits such an operation:

(i) a. I said I'd feel like climbing the mountain, and climb it I wanna.

b. *I said I'd help wash the dishes, and wash them I helped.

(Goodall (2017: 1166-1167))

Thus, the previous approaches are insufficient.

9. More precisely, I adopt a more recent phonological approach proposed in Ackema and Neeleman (2003) and Anderson (2008), which requires a reduced word and its prosodic host to be adjacent *within the same phonological domain.* This is because Jaeggli's (1980) simple adjacency-based analysis incorrectly predicts that contraction is possible in sentence (i).

(i) One must *wanna/want (in order) to become an over-effective consumer.

(Goodall (2017: 1163))

As shown above, the infinitive marker of purpose clause cannot be used for *wanna*-contraction although it is linearly adjacent to *want*. In contrast, the phonological domain-based approach can account for it: The sentence has been assumed to have the following phonological structure, where square brackets express relevant phonological units.

(ii) [One] [must want] [(in order) to become] [an over-effective consumer]

The phonological analysis allows us to explain that contraction is prevented since *want* and *to* are separated into different phonological units. Thus, in order to explain a broader range of contraction data, we have to adopt the more recent phonological approach. However, I do not assume it in this chapter because the simple adjacency-based approach is enough to explain restriction on various phonological phenomena.

10. I assume that, among the two copies of √meet, the higher one (<√meet, v>) is pronounced because such a copy can be uniquely realized with some categorial information. The lower copy (√meet) lacks such information, and therefore the phonological component cannot understand how to realize it.

11. Bošković (2002) shows that syntactic *wh*-movement of the second homophonous *wh*-phrase is confirmed by a parasitic gap (PG) in Romanian.

(i) Ce precede ce fără să influențeze
what precedes what without subj.part influences
‘ What precedes what without influencing?’

In (i), the PG depends on the object *wh*-DP. PG is generally assumed to be licensed by A'-movement, and therefore, (i) suggests that the *wh*-object syntactically moves (but realized at the lower position).

12. Wurmbrand (2014) observes that ECM verbs also allow VPE, as shown in (i).

(i) ?They say that Mary doesn't like raisins but Bill believes her to.

(Wurmbrand (2014: 406))

However, among various infinitival complement clauses she observes, VPE is slightly degraded only in ECM complement clauses. I think that there is a possibility that her observation rather suggests that VPE is disallowed in ECM complement clauses.

13. Zwicky (1982) takes the phonological dependency of infinitive markers as a kind of cliticization. Given that cliticization applies before PF-Copy Deletion like the case of *to*-contraction, infinitive markers are affixed to its prosodic host before PF-Copy Deletion. This means that the phonological process is affected by phonologically mapped copies which becomes empty superficially through PF-Copy Deletion.

14. Some authors argue against Lakoff's suggestion by pointing out that a reduced finite auxiliary verb does not need its host on its left (cf. Sato (2012) and Anderson (2008)). For example, in (i), the reduced finite auxiliary ('s) immediately follows a gap created by *wh*-movement.

(i) What do you think's happening? (Sato (2012: 302))

However, the argument is unreasonable because finite auxiliary verbs and infinitival ones behave differently. One of the differences is that the former cannot precede a gap while the latter can.

(i) a. *I will finish work at 5 and you'll too.

b. I will have finished work at 5 and you will've too.

(Aelbrecht and Harwood (2015: 77))

This difference suggests that reduced finite auxiliaries are proclitics while reduced infinitival ones are enclitics (see also Bresnan (1978) and Wilder (1997)). Therefore, I maintain Lakoff's suggestion in this chapter.

15. My proposal potentially has a consequence that copy distinction can be reflected on the semantic side. I present sentences in (i) which show the presence or absence of reconstruction effect (lower copy interpretation).

(i) a. *[Which picture of John$_i$]$_j$ did he$_i$ like t$_j$ best?

b. [Every picture of John$_i$]$_j$ seems to him$_i$ to be t$_j$ great.

(Lechner (2015: 1231, 1233))

These sentences have an R-expression inside the moving elements and a subject pronoun co-referential with the R-expression. If the moving materials leave a copy at the base-generated position (t$_j$), we predict that both of them are ungrammatical because of Condition C violation. This is the case for (ia) but not for (ib). Therefore, the contrast suggests that A'-movement leaves copies while A-movement does not in the semantic component. The difference is explained by my proposal. Sentences in (ia, b) has the structures of (iia, b).

(ii) a … he$_{[\varphi]}$ T$_{[\varphi]}$-did [$_{vP}$ ~~[which picture of John]~~ ~~he~~ <√like, v> [$_{<\varphi, \varphi>}$ √like$_{[\varphi]}$ [which picture$_{[\varphi]}$ of John]] …

b. … to him [$_{<T, C>P}$ ~~[every picture of John]~~ <T, C>-to be [$_{AP}$ ~~[every picture of John]~~ great]] …

Structure of (iia) contains an undeleted lower copy at the object position, and hence Condition C is violated. On the other hand, that of (iib) does not contain such a lower copy, and hence Condition C is not violated. Thus, the A/A' -asymmetry might be explained by my proposal. However, I admit some problems with this extension (see note 4). In addition, the semantic effect can be also explained by the Late Merge approach proposed in chapter 2. Now, I do not pursue the question of which approach is better, and leave this topic for future research.

Chapter 4

Phonological Analysis of Function Word Stranding Operations*

4.1 Introduction

The goal of this chapter is to propose a phonological analysis of some linguistic phenomena concerning ellipsis and movement. In the literature, there have been many syntactic approaches to them, but these approaches have conceptual and empirical problems when they try to cover a wide variety of data. Then, we need an alternative to the syntactic approaches. Since the inception of the Minimalist Program, the limit of syntactic approaches has been covered by appealing to processes or conditions at interfaces between Narrow Syntax and performance systems. Along this line, this chapter tries to reanalyze some linguistic phenomena in terms of constraints on the syntax-phonology interface. More specifically, on the basis of Sato and Dobashi's (2016) analysis of the *that*-trace effect, I propose that linguistic phenomena are constrained to provide legitimate phonological structures. Particularly, I apply the phonological analysis to VP-ellipsis (VPE) and preposition stranding (P-stranding) movement.

This chapter is organized as follows. In section 4.2, I will introduce some phonological studies and present a phonological analysis of function word stranding operations. Then, I will apply it to VPE in section 4.3, and to P-stranding movement in section 4.4. Section 4.5 is a conclusion.

4.2 A Phonological Constraint on Linguistic Operations

In the phonological studies, it has been generally assumed that a sentence is

endowed with a phonological structure (cf. Selkirk (1984), Nespor and Vogel (1986), Dobashi (2003, 2017)). The structure is analyzed into hierarchically layered constituents, as indicated in (1). In the following schema, variously sized brackets express constituents in phonology (utterance (U), intonational phrase (ι-phrase, ι), phonological-phrase (Φ-phrase, Φ), and prosodic word (ω)).

(1)
( )U
( )ι ( )ι
( )Φ ( )Φ( )Φ ( )Φ
( )ω( )ω ( )ω( )ω ( )ω( )ω ( )ω( )ω

These constituents are defined by their phonological properties (for instance, utterance is the biggest constituent which includes a whole sentence, and ι-phrase is characterized as the domain for pause). The layered phonological structure is commonly assumed in phonology although there are differences among phonological works.[1]

Phonological structures are mapped from syntactic ones in the way that is subject to certain mapping constraints. Some authors propose a representational mapping system which assumes a certain relation between syntactic representations and their phonological counterparts (cf. Selkirk (1984, 2011), Nespor and Vogel (1986) and Truckenbrodt (1995, 1999)). For example, Selkirk (1984, 2011) and Truckenbrodt (1995, 1999) propose some isomorphism between syntactic constituency and phonological constituency (e.g. clause = ι-phrase, phrase = Φ-phrase and syntactic word = prosodic word ω). On the other hand, Dobashi (2003, 2017) presents derivational mapping rules by referring to the ordering process under the Phase

Theory (cf. Chomsky (2000, 2001)) or by using Labeling Algorithm (cf. Chomsky (2013, 2015)).

Each analysis has its advantages and disadvantages, and therefore it is too difficult to determine which mapping system is the best one. I do not pursue the best mapping mechanism here since the comparison of these approaches is out of the purpose of this chapter. Instead, I will simply follow previously observed phonological phrasing patterns, when I analyze phonological structures of sentences. Specifically, I assume with Nespor and Vogel (1986) and Dobashi (2003, 2017) that each Φ-phrase typically consists of one lexical word, and (if any) one or more function words on its left. Consequently, standard Φ-phrasing is expressed as in (2). Here, I illustrate Φ-phrasing of a simple transitive construction (2a) and that of a transitive construction with a clause-taking predicate (2b) (with an optional adjunct).

(2) a. (C Subject)$_{\Phi}$ (T-v-V)$_{\Phi}$ (Object)$_{\Phi}$ ((Adjunct)$_{\Phi}$)

b. (C Subject)$_{\Phi}$ (T-v-V)$_{\Phi}$ (C Subject)$_{\Phi}$ (T-v-V)$_{\Phi}$ (Object)$_{\Phi}$ ((Adjunct)$_{\Phi}$)

The point here is that there is no Φ-phrase composed of only function words. This Φ-phrase formation is subject to a major constraint on syntax-phonology mapping. In the phonological literature, previous works on syntax-phonology mapping propose that mapping processes do not equally apply to all syntactic categories. Specifically, function words cannot form a prosodic constituent as many as lexical words can since the former is phonologically insufficient compared to the latter (see Selkirk (1984, 1986, 1996), Truckenbrodt (1995, 1999) and Sato and Dobashi (2016)). In order to explain the deficiency of function words, various mapping conditions have been proposed. Here, I bring Sato and Dobashi's formulation in (3) (the parenthetical

expression is added by me).

(3) Function words cannot form a prosodic phrase (=Φ-phrase) on their own.

(Sato and Dobashi (2016: 333))

According to this, Φ-phrase formation is constrained to contain at least one lexical word. If a Φ-phrase violates condition (3), a sentence with the illegitimate phonological constituent is not licensed phonologically

The important point to my argument is that the condition in (3) restricts possible phonological outputs. This leads us to consider that the constraint may also regulate some ellipsis and movement that modify phonological structures (ellipsis removes targeted constituents from phonological representations, and movement changes pronounced positions of displaced materials). Minimalist Program assumes that derivations have to proceed up to performance systems so as to provide sound/meaning representations legible for performance systems. On the phonological side of the derivations, this means that every operation is constrained to satisfy prosodic conditions such as (3) so as to provide legible phonological structures. That is, if ellipsis or movement provides phonological structures that observe the constraint, those structures are phonologically licensed and corresponding sentences may be grammatical. In contrast, if ellipsis or movement provides illegitimate phonological structures violating the constraint, the phonological output is not licensed and a corresponding sentence is ungrammatical. Thus, the phonological condition in (3) restricts operations by regulating their phonological outputs.

This kind of phonological analysis has already been proposed in Sato and Dobashi (2016) for the *that*-trace effect, Anderson (2008) for auxiliary contraction,

Thoms and Sailor (2017) for extraction from *do*-ellipsis in British dialects and others. Now, let me briefly review Sato and Dobashi (2016) to demonstrate how this approach analyzes linguistic phenomena.

First, let me illustrate the *that*-trace effect with sentences in (4). These sentences show restriction on extraction that eliminates *that*-trace configuration. As (4a) shows, a subject cannot be extracted from the position behind an overt complementizer, but it can if complementize is covert. On the other hand, object extraction in (4b) and adjunct extraction in (4c) are possible regardless of whether a relevant complementizer is overt or covert.

(4) a. Who$_i$ do you think (*that) t_i wrote the book?

b. What$_i$ do you think (that) Bill wrote t_i?

c. When$_i$ do you think (that) Bill wrote the book t_i?

(Sato and Dobashi (2016: 336))

Adopting Dobashi's (2003) syntax-phonology mapping principle, which leads to the basic Φ-phrasing pattern in (2), Sato and Dobashi give the sentences in (4) the following phonological structures:

(5) a. who$_i$ do you think (*that t_i)$_\Phi$ (wrote)$_\Phi$ (the book)$_\Phi$

a. who$_i$ do you think ~~that~~ t_i (wrote)$_\Phi$ (the book)$_\Phi$

b. what$_i$ do you think ((that) Bill)$_\Phi$ (wrote)$_\Phi$ t_i

c. when$_i$ do you think ((that) Bill)$_\Phi$ (wrote)$_\Phi$ (the book)$_\Phi$ t_i?

Based on the Φ-phrasing pattern in (2), a complementizer is grouped with a subject

noun into a Φ-phrase. In (5a), an overt complementizer is stranded within a Φ-phrase alone as a result of the subject extraction: Movement of the *wh*-subject removes the lower subject copy from the phonological structure, and leaves only the complementizer within it. The resulting Φ-phrase *(that t)*$_{\Phi}$ violates condition (3) in that it is composed of only a function word. Consequently, sentence (4a) is ungrammatical with the overt complementizer because of the phonological illegitimacy. In contrast, if the complementizer is also removed from a phonological representation as in (5a'), the illegitimate Φ-phrase is not contained in the phonological structure. Then, the resulting phonological structure is completely legitimate, and hence the corresponding sentence (4a) is grammatical without the overt complementizer. Last, phonological structures in (5b, c) observe the phonological constraint since the overt complementizer forms a Φ-phrase with a following subject noun. The phonological representations are legitimate, and therefore the corresponding sentences (4b, c) are grammatical.

Thus, Sato and Dobashi (2016) phonologically analyze the *that*-trace effect. Summarizing their analysis, it is impossible to apply movement that leaves a function word alone within a Φ-phrase since the phonological output is illegitimate. The phonological analysis leads us to predict that the function word stranding operation is licensed if illegitimate phonological structures are modified into legitimate ones through some phonological process. In fact, Sato and Dobashi account for some amelioration effects on the *that*-trace effect along this line. They first assume with Kratzer and Selkirk (2007) that the PF-interface consists of several stages, and that an early phonological structure may be modified through some phonological operations. Given this assumption, even if illegitimate phonological structures are obtained at an early phonological stage, corresponding sentences may be grammatical once the

illegitimate phonological structures are modified to a legitimate one at a later point. Sato and Dobashi account for amelioration effects of the *that*-trace effect by appealing to various phonological processes. Among their analyses, I show that of Right-Node-Raising (RNR), which involves focus-based prosodic restructuring. See sentence (6), where focused elements are marked with **SMALL CAPITAL**.

(6) That's the guy Jim's been wondering **IF** and Tom's been saying **THAT** really likes Sue. (Sato and Dobashi (2016: 341))

Here, subject extraction is possible even though it forms the *that*-trace configuration. In order to explain the grammaticality, Sato and Dobashi appeal to a prosodic restructuring operation in (7).

(7) Focus Restructuring: English (Kenesei and Vogel (1995))
If some word in a sentence bears focus, place a Φ-phrase boundary at its right edge, and join the word to the Φ-phrase on its left.

(7) states that Φ-phrases are restructured in a systematic way based on focus. In Kenesei and Vogel (1995), this restructuring operation is motivated by the effect on the *Rhythm Rule*, which is responsible for stress shift that avoids the clash of two adjacent stresses within a Φ-phrase. Since the Rhythm Rule applies inside of a Φ-phrase, stress shift takes place if stresses are adjacent within a single Φ-phrase, but it does not occur if stresses are separated into different Φ-phrases. This is schematized in (8) where "**á**" marks a word stress.

(8) a. (aaa**á** **á**aaaa)$_{\Phi}$ → (**á**aaa **á**aaaa)$_{\Phi}$ Stress Shift

b. (aaa**á**)$_{\Phi}$ (**á**aaaa)$_{\Phi}$ → (aaa**á**)$_{\Phi}$ (**á**aaaa)$_{\Phi}$ No Stress Shift

Bearing this in mind, consider the examples in (9).

(9) a. It's hard (to outcláss)$_{\Phi}$ (Délaware's football team)$_{\Phi}$

→ … (to outcláss)$_{\Phi}$ (Délaware's football team)$_{\Phi}$

b. It's hard (to outcláss)$_{\Phi}$ (**DÉLAWARE'S** football team)$_{\Phi}$

→ … (to óutclass **DÉLAWARE'S**)$_{\Phi}$ (football team)$_{\Phi}$

(Kenesei and Vogel (1995: 19, 22))

In (9a), two stresses are adjacent but stress shift does not take place because they are separated into different Φ-phrases. However, if focus is placed on the possessor, then word stress on *outclass* is shifted, as in (9b). This suggests that the relevant words *óutclass* and *DÉLAWARE'S* are contained within a single Φ-phrase in this environment. The stress shift pattern straightforwardly follows from Focus Restructuring in (7). Specifically, the focused word *DÉLAWARE'S* is added to the Φ-phrase on its left, and then stress shift takes place to avoid clash of the adjacent stresses within the restructured Φ-phrase.

Let us return to the subject extraction in RNR contexts given in (6). Sato and Dobashi show that a final word in each conjunct of RNR is focused, and propose that it undergoes Focus Restructuring. As a result, they provide sentence (6) with the phonological representation in (10), which shows the base phonological representation in (10a), and the phonologically restructured one in (10b).

(10) a. That's the guy Jim's (been wondering)$_{\Phi}$ (**IF**)$_{\Phi}$ and Tom's (been saying)$_{\Phi}$ (**THAT**)$_{\Phi}$ really likes Sue.

→ Focus Restructuring

b. That's the guy Jim's (been wondering **IF**)$_{\Phi}$ and Tom's (been saying **THAT**)$_{\Phi}$ really likes Sue.

In (10a), the two complementizers *IF* and *THAT* both lack following subject nouns as a result of subject extraction. The phonological structure violates the condition in (3), and hence it should not be licensed. However, the illegitimate structure is modified into a different one at a later stage through Focus Restructuring. Then, we obtain the phonological structure of (10b), where the complementizers are added to Φ-phrases on their left. Since the stranded complementizers can form Φ-phrases with a lexical word, the eventual phonological structure is licensed, and the corresponding sentence becomes grammatical. Thus, subject extraction in (6) is allowed through prosodic restructuring.[2]

Thus, Sato and Dobashi explain various subject extraction data in terms of phonological legitimacy. Although their analysis is limited to the *that*-trace effect, I argue that it holds for a wider variety of linguistic phenomena. In the following two sections, I will try to extend the phonological analysis to other cases. Section 4.3 will extend the analysis to VPE, and then section 4.4 applies it to P-stranding movement.

4.3 Ellipsis: VPE

4.3.1 Fact

In English, VPE is allowed as exemplified in (11), where a missing VP is

indicated by underline "__."

(11) John has left, and Bill has __, too. (Zagona (1988: 95))

Here, the VP is not pronounced in the second conjunct but it is interpreted as "left," according to its antecedent. Sentence (11) shows that this ellipsis is possible in a coordinated root clause. This kind of ellipsis is also allowed in a finite complement clause (12a), a finite subject clause (12b) and a finite adjunct clause (12c).

(12) a. John wants to win, and Bill convinced him that he would __.
b. John doesn't want to leave, but that he should __ is obvious.
c. John loves to cook, and he got some new pots so that he can __.

(ibid.: 108)

Thus, VPE in finite clauses is allowed rather freely in English.

In contrast, VPE is not applied so freely within infinitival clauses: It is possible in an infinitival complement clause (13a) but impossible in an infinitival subject clause (13b) or an infinitival adjunct clause (13c).

(13) a. Mag Wildwood wants to read Fred's story, and I also want to __.
b. *You shouldn't play with rifles because to __ is dangerous.
c. *Mag Wildwood came to read Fred's story, and I also came to __.

(Johnson (2001: 440, 442))

The contrast in (13) shows that VPE in infinitival clauses is restricted compared to the

case of finite clauses. In the literature, the asymmetry between finite clauses and infinitival clauses has been addressed by some syntactic approaches, but their analyses have conceptual and empirical problems. In the following subsections, I will review two kinds of famous approaches to the distribution of VPE and point out their problems.

4.3.2 Previous Analyses and Their Problems

4.3.2.1 Empty Category Principle-Based Analyses

In the *Government and Binding* framework, the distribution of VPE has been analyzed by making use of the concept of *government*. Specifically, the distribution of ellipsis is constrained by *Empty Category Principle* (ECP), according to which an empty category must be properly governed. In this subsection, I show two analyses proposed in Zagona (1988) and Lobeck (1995) and their problems.

First, let us begin with Zagona (1988). She proposes that an inflection head (INFL) in a finite clause θ-marks VP and the θ-marking relation allows it to serve as a proper governor for an elided VP. (More precisely, she assumes that the assignment of a θ-role involves not only the assignment of the role but also the assignment of a referential index (cf. Stowell (1981)).) Since the finite INFL-head can properly govern the relevant empty category, VPE is always licensed in finite clauses.

In contrast, she assumes that an infinitival INFL does not fully θ-mark VP: The INFL assigns a role to its complement VP, but it does not assign an independent referential index to it. If θ-government requires assignment of the θ-role and the referential index, VPE is banned in infinitival clauses because an elided VP is not θ-governed by the infinitival INFL. However, she also assumes that, if an infinitival

clause itself is assigned a θ-role and an associated referential index, the referential index is transmitted to a clause-internal VP. Then, VPE in an infinitival clause is licensed if the infinitival clause is assigned a referential index. These assumptions account for the contrast between an infinitival complement clause and an infinitival adjunct clause:

(14) a. Mag Wildwood wants to read Fred's story, and I also want [$_{CP}$ to [$_{VP}$__]]

index assignment + co-indexing

b. *Mag Wildwood came to read Fred's story, and I also came [$_{CP}$ to [$_{VP}$__]]

no index assignment to CP

Among these sentences, VPE is possible in the infinitival complement clause since the infinitival clause is assigned a θ-role and an associated referential index. In contrast, VPE cannot apply in the infinitival adjunct clause because the adjunct clause including the elided VP is not assigned any θ-role or any referential index.

This analysis has several problems. First, the concept of government does not exist in the current Minimalist framework. Therefore, the analysis based on this concept cannot be maintained now. Second, Zagona's analysis incorrectly eliminates some grammatical VPE sentences. Specifically, her analysis always precludes VPE in infinitival adjunct clauses because an elided VP cannot be properly governed unless the infinitival clause itself is θ-marked. However, VPE is actually permitted in infinitival adjunct clauses if a sentential negation accompanies the clauses, as illustrated in (15).

(15) Mag Wildwood came to introduce the barkeep but I came (precisely) not to __. (Johnson (2001: 447))

That is, Zagona's approach is problematic in that it incorrectly eliminates VPE in (15).

Next, let us move on to Lobeck's (1995) analysis. She also proposes an ECP-based analysis but makes a different assumption about VPE licensing from Zagona's one: VPE is licensed if the ellipsis site is properly governed by a head with a strong agreement relation. She explains that VPE in finite clauses is licensed by an INFL head that has a tense feature, but VPE in infinitival clauses is not licensed by an INFL that lacks a tense feature. Then, she proposes that head-incorporation of the infinitival INFL to certain heads helps license VPE in infinitival clauses. Specifically, VPE in infinitival complement clauses is licensed because the infinitival INFL incorporates into a matrix verb that helps license VPE. However, the same strategy cannot be used in the case of adjunct clauses because the required incorporation is prevented due to the adjunct condition.

(16) a. …, and I INFL also want [$_{\text{CompCP}}$ to__]

head incorporation

b. *…, and I also came [$_{\text{AdjCP}}$ to__]

head incorporation is banned due to the adjunct condition

Moreover, she also explains that VPE in infinitival adjunct clause is licensed with a sentential negation because the infinitival INFL incorporates into a Neg-head that helps license VPE.

(17) … but I came [Op Neg-not to __]

head incorporation

Thus, Lobeck's analysis can explain the VPE sentence that Zagona's one cannot.

However, this analysis also has some problems. First, it has the same conceptual problem as Zagona's (1988) in that it builds on government (though the idea about agreement-based licensing is proposed now). Furthermore, it incorrectly excludes VPE in infinitival subject clauses such as (18), where an infinitival subject accompanies an infinitival subject clause.

(18) (For John to win the race was annoying.)

?For Bill to __ would have been much more exciting.

(Lobeck (1995, 188, fn 6))

Here, the infinitive marker can neither license VPE by itself nor incorporate into a matrix verb out of the subject clause due to the subject condition. Therefore, Lobeck's analysis precludes sentence (18), contrary to fact.

Thus, the two ECP-based analyses have conceptual and empirical problems. Conceptually, they are not maintained now as long as they build on the concept of government. Empirically, Zagona's analysis incorrectly precludes VPE in infinitival adjunct clauses with a sentential negation, and Lobeck's one also incorrectly eliminates grammatical VPE in subject clauses with an infinitival subject.

4.3.2.2 Topicalization-Based Analysis

Johnson (2001) attempts to derive the restriction on VPE from parallelism

between VPE and VP-Topicalization (VPT). Specifically, he proposes that VPE is licensed by VPT. This proposal is based on the following comparison between VPE and VPT.

(19) a. Mag Wildwood wants to read Fred's story, and I also want to __. (= (13))

b. *You shouldn't play with rifles because to __ is dangerous.

c. *Mag Wildwood came to read Fred's story, and I also came to __.

(20) a. [Read Fred's story], I also want to t_{VP}.

b. *You shouldn't play with rifles because [play with rifles] to t_{VP} is dangerous. (Johnson (2001: 447))

c. *Lulamae Barnes recounted a story to remember because [remember] Holly had recounted a story to t_{VP}. (ibid.)

These examples show that VP can be elided where it can be topicalized: Both of the operations can target VPs in complement clauses but cannot target VPs in subject clauses or adjunct clauses. The parallelism leads Johnson to propose that VP must be topicalized to be elided. That is, he proposes that VPE and VPT show the same grammaticality since VPE includes the step of VPT.

However, this analysis is falsified by some mismatches between VPE and VPT. We can see that some VPE sentences are grammatical even though its VPE counterparts are ungrammatical. First, Johnson (2001) himself admits that VPE can be licensed with a sentential negation even in a subject clause and an adjunct clause though their VPT counterparts are ungrammatical.

(21) a. You should unload rifles because not to __ is dangerous.

b. Mag Wildwood came to introduce the barkeep but I came (precisely) not to __. (Johnson (2001: 447))

(22) a. *You should unload rifles because [unload rifles] to t_{VP} is dangerous.

b. *Mag Wildwood came to introduce the barkeep but [introduce the barkeep] I came (precisely) not to t_{VP}.

VPE can apply if there is a negation within an infinitival subject clause or an infinitival adjunct clause as in (21), but VPT cannot apply even with the negation, as in (22). If VPE sentences are licensed by VPT, sentences of (21) should be also prohibited like those of (22). In the same way, Aelbrecht and Haegeman (2012) point out some mismatches between VPE and VPT in finite clauses. Specifically, VPE is possible in a finite subject clause and a finite adjunct clause as in (23) while VPT counterparts are ungrammatical as in (24).

(23) a. John doesn't want to leave, but that he should __ is obvious. (= (12))

b. John loves to cook, and he got some new pots so that he can __.

(24) a. *John doesn't want to leave, but [leave] that he should t_{VP} is obvious.

b. *John loves to cook, and [cook] he got some new pots so that he can t_{VP}.

Thus, Johnson's VPT-based analysis is also problematic because there are various mismatches between VPE and VPT.

4.3.3 Analysis

Thus far, I have shown two famous syntactic analyses of the distribution of VPE and their problems. In this subsection, I propose a phonological analysis along the

line of Sato and Dobashi's (2016) analysis of the *that*-trace effect. More specifically, I will demonstrate that VPE is grammatical if its remnant is phonologically legitimate.

I start with the case of VPE in a finite root clause in (11), repeated here as (25).

(25) John has left, and Bill has __, too.

According to the standard Φ-phrasing pattern in (2), a Φ-phrase is composed of a lexical word and (if any) one or more function words on its left. Therefore, a T-head usually forms a Φ-phrase with a following verb. However, once VPE applies, the verb is lost in a phonological representation. Consequently, the VPE sentence in (25) first obtains the following phonological structure.

(26) John has left, (and Bill)$_{\Phi}$ (has ~~left~~)$_{\Phi}$ (too)$_{\Phi}$

According to the constraint that function words cannot form a Φ-phrase on its own, the phonological structure is illegitimate since a function word *has* composes a Φ-phrase alone. However, the phonological structure is modified at a later stage via Focus Restructuring. Samko (2014) and Lopez and Winkler (2000) assume that VPE is licensed by a focused T-head.[3] Therefore, the phonological structure of (26) is modified later as follows:

(27) a. John has left, (and Bill)$_{\Phi}$ (**HAS**)$_{\Phi}$ (too)$_{\Phi}$

→ Focus Restructuring

b. John has left, (and Bill **HAS**)$_{\Phi}$ (too)$_{\Phi}$

Here, the stranded T-head *HAS* is incorporated into a preceding Φ-phrase. As a result, the function word can compose a Φ-phrase with a lexical word, the subject noun *Bill*. Since the resulting phonological structure is legitimate, sentence (25) is grammatical.

Along the same line, the current analysis predicts that VPE is always licensed in finite clauses, as observed in (12) in section 4.3.1. This is because VPE remnants always becomes phonologically legitimate through Focus Restructuring. Stranded tensed auxiliaries compose a Φ-phrase with a subject noun, as shown below:

(28) a. John wants to win, and Bill convinced him that he would __.

b. …and Bill convinced him (that he)$_{\Phi}$ (**WOULD**)$_{\Phi}$ __

→ Focus Restructuring

c. …and Bill convinced him (that he **WOULD**)$_{\Phi}$ __

(29) a. John doesn't want to leave, but that he should __ is obvious.

b. …(that he)$_{\Phi}$ (**SHOULD**)$_{\Phi}$ __ is obvious

→ Focus Restructuring

c. … (that he **SHOULD**)$_{\Phi}$ __ is obvious

(30) a. John loves to cook, and he got some new pots so that he can __.

b. …and he got some new pots (so that he)$_{\Phi}$ (**CAN**)$_{\Phi}$ __

→ Focus Restructuring

c. and he got some new pots (so that he **CAN**)$_{\Phi}$ __

Thus, the grammaticality of VPE in finite clauses is in part determined by its phonological representation.[4]

Next, let us move on to some ungrammatical cases of VPE in infinitival clauses. I attribute the ungrammaticality to the failure of providing legitimate phonological

structures. Since the current analysis assumes that phonologically legitimate VPE remnants are obtained through Focus Restructuring, the grammaticality of VPE now can be reduced to the applicability of Focus Restructuring. That is, VPE in infinitival clauses is allowed if Focus Restructuring succeeds, while it is disallowed if the prosodic restructuring is prevented for some reasons. To set the stage for my analysis, let us now introduce the constraint on Focus Restructuring by reviewing Kenesei and Vogel (1995) and Frascarelli (2000).

Kenesei and Vogel (1995) and Frascarelli (2000) observe that focus triggers prosodic restructuring, but it is disturbed by intonational phrase (ι-phrase) which is a larger phonological constituent than Φ-phrase. See example (31) that shows restriction on Focus Restructuring.

(31) Martha, (according to Paulíne,)ι (**ÓWNS**)$_{\Phi}$ the house.

→ *... ((according)$_{\Phi}$ (to Páuline)$_{\Phi}$)ι (**ÓWNS**)$_{\Phi}$ (the house)$_{\Phi}$

(Kenesei and Vogel (1995: 29))

Here, stresses on the two words *Paulíne* and *ÓWNS* are adjacent but separated into different Φ-phrases. Notice that, among the two words, the second one is focused. Following the Focus Restructuring rule, we predict that the focused word is added to the preceding Φ-phrase and then Rhythm Rule should apply to avoid clash of two adjacent stresses within the restructured Φ-phrase. However, sentence (31) does not show the stress shift, and hence suggests that neither Focus Restructuring nor Rhythm Rule applies in this circumstance. The point is that the word *Paulíne* is included in a parenthetical. In the phonological literature, parentheticals are known to form an ι-phrase independently. Hence, in (31), the relevant two words *Paulíne* and *ÓWNS*

are separated by an ι-phrase boundary introduced by the parenthetical. Kenesei and Vogel (1995) and Frascarelli (2000) take this data to suggest that Focus Restructuring does not apply across an ι-phrase boundary.

Then, let us return to the analysis of VPE in infinitival clauses. Remember that the grammaticality of VPE now depends on the applicability of Focus Restructuring. Since the prosodic restructuring is blocked by ι-phrase boundaries, we may explain VPE data by checking whether ι-phrases disturb the desired prosodic restructuring. Now, I start with the analysis of VPE in infinitival complement clauses. First, along the same line as VPE in finite clauses, I assume that VPE is licensed by a focused infinitival T-head. In addition, I also assume with Selkirk (2005) that a complement clause does not introduce an ι-phrase by itself. Given these assumptions, sentence (32a) undergoes the phonological derivation in (32b, c).

(32) a. Bill wants to leave, but Mary **DOUESN'T** want **TO** __

b. Bill wants to leave, (but Mary)$_{\Phi}$ (**DOUESN'T** want)$_{\Phi}$ (**TO**)$_{\Phi}$

→ Focus Restructuring

c. Bill wants to leave, (but Mary **DOUESN'T**)$_{\Phi}$ (want **TO**)$_{\Phi}$

Here, the infinitive marker *TO* is first left alone within a Φ-phrase in (32b). Given that function words cannot form a Φ-phrase by themselves, this phonological structure is illegitimate. However, it is modified later through Focus Restructuring. The restructuring is not blocked in this environment since the focused word and the preceding Φ-phrase is not separated by an ι-phrase boundary. The phonological representation in (32c) is legitimate, and hence the VPE is grammatical.

Next, let us move on to VPE in infinitival subject clauses. According to Selkirk

(1978) and An (2007), a subject clause forms an ι-phrase independently. Hence, sentence (33a) has the phonological structure of (33b).

(33) a. *You shouldn't play with rifles because **TO** __ is dangerous.

b. …because ((**TO**)$_{\Phi}$)ι __ is dangerous

→ Focus Restructuring is blocked

Although the stranded infinitive marker is focused, it cannot be incorporated into a preceding Φ-phrase because Focus Restructuring is prevented by the ι-phrase boundary. The resulting Φ-phrase *(TO)*$_{\Phi}$ is illegitimate, and therefore VPE is ungrammatical in infinitival subject clauses. However, we predict that VPE may be grammatical even in this environment if an infinitive marker composes a Φ-phrase with a lexical word within a subject clause. In fact, VPE is allowed if a subject clause contains a lexical subject or a negation, as shown below:[5]

(34) a. (For John to win the race was annoying.)

?For Bill **TO** would have been much more exciting.

b. ((for Bill)$_{\Phi}$ (**TO**)$_{\Phi}$)ι would have been much more exciting

→ Focus Restructuring

c. ((for Bill **TO**)$_{\Phi}$)ι would have been much more exciting

(35) a. You should unload rifles because not **TO** _is dangerous.

b. You should unload rifles because ((not)$_{\Phi}$ (**TO**)$_{\Phi}$)ι is dangerous

→ Focus Restructuring

c. You should unload rifles because ((not **TO**)$_{\Phi}$)ι is dangerous

Thus, the VPE data given above are explained by the proposed phonological analysis: VPE is allowed if Focus Restructuring provides a legitimate phonological structure while it is disallowed if the prosodic restructuring fails.

This analysis is supported by the fact that VPE is also restricted in other contexts which involve ι-phrasing. In the phonological literature, many authors observe that various constructions involve ι-phrasing. On the basis of the previous observations, we can see that VPE is prohibited if ι-phrases are introduced so as to block Focus Restructuring, while the ellipsis is allowed if the ι-phrases do not prevent Focus Restructuring. The first example involves parentheticals (for prosodic status of parentheticals, see Nespor and Vogel (1986), Selkirk (2005), Dobashi (2018), Potts (2005) and others). If an infinitive marker directly follows a parenthetical, VPE is impossible as shown in (36a). However, if the parenthetical follows a stranded infinitive marker, VPE is possible as in (37a).

(36) a. *For John to help Mary will make her happy and for Bill, as she hopes, **TO** __ will make her happier.

b. …(for Bill,)$_{\Phi}$ (as she hopes,)ι (**TO**)$_{\Phi}$ will make her happier

→ Focus Restructuring is blocked

(37) a. For John to help Mary will make her happy and for Bill **TO** __, as she hopes, will make her happier.

b. …(for Bill)$_{\Phi}$ (**TO**)$_{\Phi}$, (as she hopes,)ι will make her happier

→ Focus Restructuring

c. …(for Bill **TO**)$_{\Phi}$, (as she hopes,)ι will make her happier

The contrast shows that VPE is disallowed if an ι-phrase boundary is placed so as to

prevent leftward prosodic restructuring while VPE is allowed if an ι-phrase is positioned so as not to disturb it. These data support the view that the grammaticality of VPE in infinitival clauses depends on the applicability of Focus Restructuring.

The second example involves non-restrictive relative clauses (NRRs). This is also known to form an ι-phrase (cf. Nespor and Vogel (1986), Selkirk (2005), Dobashi (2018), Potts (2005) and others). They have the same effect as that of parentheticals: VPE is impossible if an infinitive marker follows an NRR while it is possible in the reverse order.

(38) a. *For John to help Mary will make her happy and for Bill, who she likes the best, **TO** __ will make her happier.

b. …(for Bill,)$_{\Phi}$, (who she likes the best,)ι (**TO**)$_{\Phi}$ will make her happier

→ Focus Restructuring is blocked

(39) a. For John to help Mary will make her happy and for Bill **TO** __, who she likes the best, will make her happier.

b. …(for Bill)$_{\Phi}$, (**TO**)$_{\Phi}$, (who she likes the best,)ι will make her happier

→ Focus Restructuring

c. …(for Bill **TO**)$_{\Phi}$, (who she likes the best,)ι will make her happier

The third example involves gapping. Selkirk (2005) observes that remnants of gapping independently form an ι-phrase. If VPE applies within a remnant and leaves an infinitive marker alone, gapping is ungrammatical. In contrast, if there is an additional element that infinitive marker can phonologically depend on, VPE is possible.

(40) a. *John wants not to leave, but **BILL**, **TO** _.

b. John wants not to leave, ((but **BILL**)$_{\Phi}$)$_{\iota}$ ((**TO**)$_{\Phi}$)$_{\iota}$

→ Focus Restructuring is blocked

(41) a. John wants to leave, but **BILL**, not **TO**

b. John wants to leave, ((but **BILL**)$_{\Phi}$)$_{\iota}$ ((not)$_{\Phi}$ (**TO**)$_{\Phi}$)$_{\iota}$

→ Focus Restructuring

c. John wants to leave, ((but **BILL**)$_{\Phi}$)$_{\iota}$ ((not **TO**)$_{\Phi}$)$_{\iota}$

Fourth, rightward-moved elements are also known to form an ι-phrase independently (cf. An (2007) and Shiobara (2010)). As expected, VPE is prevented if it leaves an infinitive marker within a rightward-moved position, unless the infinitive marker is accompanied with a lexical word such as a negation.

(42) a. *John wants for some reason to leave, and Bill wants for another reason **TO** __.

b. …Bill wants for another reason ((**TO**)$_{\Phi}$)$_{\iota}$

→ Focus Restructuring is blocked

(43) a. John wants for some reason to leave, and Bill wants for another reason not **TO** __.

b. …Bill wants for another reason ((not)$_{\Phi}$ (**TO**)$_{\Phi}$)$_{\iota}$

→ Focus Restructuring

c. …Bill wants for another reason ((not **TO**)$_{\Phi}$)$_{\iota}$

Similarly, RNR construction involves ι-phrasing. This construction is known to consist of three ι-phrases formed by two conjuncts and a right-node-raised constituent

(cf. Swingle (1993)). If an infinitive marker is left alone in a right-node-raised position, VPE is impossible as shown in (44). However, if there is a lexical word within the position, the grammaticality improves as in (45).

(44) a. *Mary doesn't like to get up early while John prefers, and Bill wants, **TO** __.

b. …(while John prefers)ι (and Bill wants)ι ((**TO**)$_{\Phi}$)ι

→ Focus Restructuring is blocked

(45) a.?(?)Mary likes to stay up late while John prefers, and Bill wants, not **TO** __.

b. …(while John prefers)ι (and Bill wants)ι ((not)$_{\Phi}$ (**TO**)$_{\Phi}$)ι

→ Focus Restructuring

c. …(while John prefers)ι (and Bill wants)ι ((not **TO**)$_{\Phi}$)ι

Thus, all the examples presented above suggest that VPE in infinitival clauses is blocked when an ι-phrase boundary blocks Focus Restructuring. Then, they support my analysis, according to which prosodic restructuring is required to license VPE.

Thus, I have shown that restriction on VPE in infinitival clauses can be explained in terms of restriction on prosodic restructuring. However, the ι-phrase-based constraint is not all that restrict VPE: The ellipsis is prohibited in certain environments even though prosodic restructuring should succeed. For illustration, consider example (46), which includes VPE in an infinitival complement clause with a displaced subject.

(46) The public wanted Shultz to resign; (Zagona (1988: 103))

*Who did you want to __?

Remember that complement clauses do not introduce an ι-phrase. This means that Focus Restructuring should apply in (46) so as to form a legitimate phonological structure, though VPE is disallowed.

The ungrammaticality can be phonologically explained by considering phonological derivations including the process of Copy Deletion. Note that the phonological component consists of several stages (cf. Kratzer and Selkirk (2007) and Sato and Dobashi (2016)). In addition, if we assume with Thoms and Sailor (2017) that Copy Deletion applies after Φ-phrasing, the wh-question in (46) has the following phonological derivation:[6]

(47) a. who did you (want)$_{\Phi}$ (who)$_{\Phi}$ (**TO**)$_{\Phi}$

→ Focus Restructuring

b. who did you (want)$_{\Phi}$ (who **TO**)$_{\Phi}$

→ Copy Deletion

c. who did you (want)$_{\Phi}$ (~~who~~ **TO**)$_{\Phi}$

The infinitive marker first composes a Φ-phrase by itself, as in (47a). Then, Focus Restructuring applies and incorporates the infinitive marker into a preceding Φ-phrase as in (47b). At this stage, the phonological structure is legitimate. However, this is also modified through Copy Deletion as in (47c). As a result, the stranded infinitive marker is left alone within a Φ-phrase again, and hence the phonological structure cannot be licensed. Thus, VPE in (46) is disallowed. This account is supported by the fact that the grammaticality improves if a negation is placed within the embedded clause. My informants judge sentence (48) as more grammatical than sentence (46).

(48) ?(?)Who did you want not to __?

This sentence has the following phonological derivation.

(49) a. who did you (want)$_{\Phi}$ (who)$_{\Phi}$ (not)$_{\Phi}$ (**TO**)$_{\Phi}$

→ Focus Restructuring

b. who did you (want)$_{\Phi}$ (who)$_{\Phi}$ (not **TO**)$_{\Phi}$

→ Copy Deletion

c. who did you (want)$_{\Phi}$ (~~who~~)$_{\Phi}$ (not **TO**)$_{\Phi}$

The final phonological representation is legitimate, and therefore the VPE is phonologically licensed.

This account can be extended to the ungrammaticality of VPE in infinitival adjunct clause.[7] To set the stage, I adopt Boskovic's (2018) assumption that right-adjoined adjunct clauses are base-generated in VP-domain, and move rightward to their dedicated positions. Given the adjunct movement, sentence (50) has the syntactic structure of (51).

(50) *Mag Wildwood came to read Fred's story, and I also came to_.

(51) Mag wildwood came to read Fred's story, and
I also came [$_{CP}$ **TO** read Fred's story] [$_{CP}$ **TO** read Fred's story]

Here, the moved adjunct clause follows its copy in (51). The syntactic structure is first mapped onto a phonological structure, and then the phonological structure is restructured through Focus Restructuring. As a result, the VPE sentence obtains the

final phonological structure in (52).

(52) …(also came)$_{\Phi}$ (**TO** read)$_{\Phi}$ (Fred's story **TO**)$_{\Phi}$ (read)$_{\Phi}$ (Fred's story)$_{\Phi}$

Then, VPE and Copy Deletion yield the representation of (53).

(53) …(also came)$_{\Phi}$ (~~**TO** read)$_{\Phi}$~~ (~~Fred's story~~ **TO**)$_{\Phi}$ (~~read~~)$_{\Phi}$ (~~Fred's story~~)$_{\Phi}$

Since the infinitive marker is stranded alone within a Φ-phrase, the representation is illegitimate. Thus, VPE in infinitival adjunct clauses is excluded.[8]

In this subsection, I have explained the distribution of VPE in terms of the current phonological analysis. I have shown that VPE can apply in finite clauses freely because resulting phonological representations always become legitimate through prosodic restructuring. On the other hand, VPE in infinitival clauses is restricted depending on the VPE contexts: VPE is grammatical if Focus Restructuring succeeds, but it is ungrammatical if the restructuring is prevented by an ι-phrase boundary or legitimate phonological structure is destroyed by Copy Deletion.

4.3.4 Comparison with a Previous Phonological Analysis

Finally, I review a previous phonological analysis of VPE proposed by Zwicky (1982) and articulated by O'Flynn (2008), and show that my analysis is superior to it. The previous analysis is the same as mine in that VPE is licensed by obtaining legitimate phonological structures through some restructuring operation. However, it is different from my analysis in how to constrain the prosodic restructuring. Specifically, Zwicky (1982) formulates the restructuring operation and its restriction

as follows:

(54) *To*-Reattachment (Zwicky (1982: 29))

When it does not form a VP constituent with an immediately following VP, the English infinitive marker *to* attaches to the constituent immediately to its left, to form a Φ-phrase with it.

(55) The Own-S condition

An infinitive marker cannot move out of its surface-structure S.

Given (54) and (55), VPE is possible if a legitimate phonological structure is obtained through *To*-Reattachment but it is impossible if the reattachment is blocked by an S-boundary (i.e. clause boundary). Zwicky's phonological analysis is insightful but it is difficult to maintain within the current framework because his structural analysis is too different from the currently assumed ones. However, the phonological analysis is then modernized by O'Flynn (2008). She articulates the concept of "S" in (55), and defines such a blocking category as CP. Then, VPE is prohibited if *To*-Reattachment is prevented by a CP boundary.

Now, I briefly review O'Flynn's analysis. First, let us see a grammatical case, VPE in infinitival complement clauses. O'Flynn assumes that an infinitival complement clause forms a TP. This means that there is no CP boundary that blocks *To*-Reattachment between an infinitive marker and a clause-taking verb. I roughly schematize the syntactic structure of the relevant data and its phonological representation in (56).

(56)a. Mag Wildwood wants to read Fred's story, and I also [$_{VP}$ want [$_{TP}$ to __]]

b. Mag Wildwood wants to read Fred's story, and I also (want to)$_{\Phi}$

In (56b), reattachment makes a Φ-phrase which contains the infinitive marker and the matrix verb (*to* and *want*). The resulting phonological structure is legitimate, and therefore the sentence is grammatical.

Let us move on to an ungrammatical case, VPE in a subject clause. O'Flynn assumes that subject clauses are CPs because a subject clause moves to its argument position and it is generally assumed that moved clauses are CPs. Then, sentence (57a) has the phonological representation in (57b), where a CP boundary is expressed by round bracket with CP "( )$_{CP}$."

(57) a. *You shouldn't play with rifles because [$_{CP}$ to __]is dangerous

b. You shouldn't play with rifles because ((to)$_{\Phi}$)$_{CP}$ is dangerous

In (57b), *To*-Reattachment is blocked by the CP boundary, and hence its phonological output is illegitimate. Since VPE is not phonologically licensed, the VPE sentence is ungrammatical.

Thus, this approach accounts for the relevant VPE data, but it is not without problems. As O'Flynn herself admits, it is doubtful to take a complement clause of a control verb as TP. In fact, control predicates are widely assumed to take a CP, but not a TP. The predominant view is supported by the difference in the movability between a complement clause of a control verb and that of a raising verb.

(58) a. ?It was to win the race that we wanted.

b. *It was to be winning the race that she seemed. (O'Flynn (2008: 19))

In (58a), the complement clause of the control verb *want(ed)* can move into the focus position of the cleft sentence. In contrast, in (58b), the complement clause of the raising verb *seem(ed)* cannot move. The contrast has been explained by relating clausal structures and their movability: Control verbs take movable CP complements whereas raising verbs take immovable TP complements. (In fact, O'Flynn herself also uses this relation to assume that subject clauses form CP.) If this is right, O'Flynn's analysis incorrectly excludes (56) because the *To*-Reattachment from a control complement clause is blocked by a CP boundary. In contrast, my analysis can correctly predict the grammaticality as discussed in section 4.3.3. In this respect, my analysis is superior to the previous ones.

4.4 Movement: P-Stranding

4.4.1 Fact

In this section, I apply the proposed phonological analysis to another function word stranding operation, P-stranding movement. This is the operation whereby a nominal complement of a preposition moves with the preposition left behind, as illustrated in (59).

(59) Which book have they talked about? (Law (2017: 3164))

In the literature, there have been many syntactic analyses (see Hornstein and Weinberg (1981) for the V+P reanalysis approach under the Case Theory, Kayne (1984) for the government-based approach, Law (2007, 2017) for the D-to-P incorporation-based approach, Abels (2003) for anti-locality-based approach under the Phase Theory, and among others.) They are all insightful accounts, but none of them can provide

inclusive explanation for a wide variety of data. Furthermore, Takami (1988) points out a crucial problem for syntactic approaches: P-stranding is influenced not by syntactic factors but by some discourse-related factor. See the following two sentences which have the same syntactic structure but differ in the focus positions.

(60) a. **WHICH VACATION** did John go to Hawaii **DURING**?

b. *Which vacation did John go **TO HAWAII** during?

The contrast suggests that the grammaticality of P-stranding depends on the focus positions: P-stranding is possible only if focus is placed on the PP that contains the moved *wh*-phrase *DURING WHICH VACATION*, not on another element *TO HAWAII*. It is difficult to provide a syntactic account of the contrast since the two sentences have the common syntactic structure. In fact, as far as I know, the data has not been addressed by syntactic approaches.

In order to account for the contrast of (60), Takami proposes the following generalization:

(61) An NP can only be extracted out of a PP which may be interpreted as being more important (newer) than the rest of the sentence.

According to Oku (2009) and Uchishiba (2008), the term "important" can be translated into "focused." Hence (61) means that "an NP can only be extracted out of a PP which may be interpreted as being focused."[9] The generalization is useful, and it captures a wide variety of P-stranding data. However, it is not satisfactory: It is just descriptive, and hence we need explanation for it. In the following section, I

will derive the generalization from the current phonological analysis.

4.4.2 Analysis

In the phonological literature, prepositions are analyzed as a phonologically weak word (cf. Nespor and Vogel (1986), Selkirk (1996), Truckenbrodt (1995, 1999) and others). A preposition typically requires its complement nominal phrase as a prosodic host in order to form a legitimate phonological constituent. However, the legitimate constituent cannot be obtained in P-stranding environment because the relevant nominal phrase is removed from a phonological representation. Then, the resulting illegitimate phonological structure must be modified to legitimate one in some way in order to license P-stranding. On the basis of the proposed analysis, I argue that P-stranding is allowed if prosodic restructuring forms legitimate phonological structures.

Then, let us start my analysis of P-stranding. The analysis starts with canonical Φ-phrasing, which provides sentences in (60a, b) with the phonological representations in (62).

(62) (which vacation)$_{\Phi}$ (did John)$_{\Phi}$ (go)$_{\Phi}$ (to Hawaii)$_{\Phi}$ (during)$_{\Phi}$

At this stage, the phonological structure is illegitimate because the preposition *during* is stranded alone within a Φ-phrase. However, this structure is modified later by Focus Restructuring. As a result, sentences in (60a, b) have the phonological structures of (63a, b), respectively.

(63) a. (**WHICH VACATION**)$_{\Phi}$ (did John)$_{\Phi}$ (go)$_{\Phi}$ (to Hawaii **DURING**)$_{\Phi}$

b. (which vacation)$_{\Phi}$ (did John)$_{\Phi}$ (go **TO HAWAII**)$_{\Phi}$ (during)$_{\Phi}$

In (63a), the stranded preposition is incorporated into the Φ-phrase on its left through Focus Restructuring. Since a legitimate phonological structure is obtained, the corresponding sentence in (60a) is grammatical. In contrast, Focus Restructuring does not apply so as to modify the illegitimate constituent in (63b). Since the phonological structure cannot be licensed, the corresponding sentence in (60b) is ungrammatical. Thus, the relation between P-stranding and focus is derived from the proposed phonological analysis.[10]

Next, I move on to other restrictions on P-stranding that are related to certain constructions. The first example involves the contrast between a positive question and a negative counterpart in (64). (Following Deane (1991), I assume that a negation is focused in a negative question.)

(64) a. **WHO** did John go to Hawaii **WITH**? (Deane (1991: 32))

b. *Who **DIDN'T** John go to Hawaii with?

Here, P-stranding is allowed in the positive question but not in the negative one. Each of the questions has the phonological derivation in (65) and (66), respectively.

(65) a. (**WHO**)$_{\Phi}$ (did John)$_{\Phi}$ (go)$_{\Phi}$ (to Hawaii)$_{\Phi}$ (**WITH**)$_{\Phi}$

→ Focus Restructuring

b. (**WHO**)$_{\Phi}$ (did John)$_{\Phi}$ (go)$_{\Phi}$ (to Hawaii **WITH**)$_{\Phi}$

(66) a. (who)$_{\Phi}$ (**DIDN'T** John)$_{\Phi}$ (go)$_{\Phi}$ (to Hawaii)$_{\Phi}$ (with)$_{\Phi}$

→ Focus Restructuring

b. (who **DIDN'T**)$_{\Phi}$ (John)$_{\Phi}$ (go)$_{\Phi}$ (to Hawaii)$_{\Phi}$ (with)$_{\Phi}$

The phonological structure in (65b) is legitimate but that of (66b) is illegitimate because Focus Restructuring targets the stranded preposition only in the former. Thus, the proposed phonological derivation licenses only the former P-stranding.

The second example involves the contrast between P-stranding Heavy NP Shift (HNPS) and preposition pied-piping Heavy PP shift (HPPS) in (67a, b).

(67) a. *John looked at t_{DP} in the living room yesterday [$_{DP}$ the man who lived next door].

b. John looked t_{PP} in the living room yesterday [$_{PP}$ at the man who lived next door]. (Drummond, Hornstein, and Lasnik (2010: 689))

The contrast shows that P-stranding rightward-movement is ungrammatical but preposition-pied-piping rightward-movement is grammatical. If we assume that rightward-moved materials are focused (cf. Overfelt (2015)), these sentences have the phonological structures in (68) and (69). (In the following schemas, I assume with An (2007), Inkelas and Zec (1990) and Shiobara (2010) that a rightward-moved element forms an ι-phrase independently.)

(68) ((John)$_{\Phi}$ (look)$_{\Phi}$ (at t_{DP}) (in the living room)$_{\Phi}$ (yesterday)$_{\Phi}$)ι (**THE MAN WHO LIVED NEXT DOOR**)ι

(69) ((John)$_{\Phi}$ (look)$_{\Phi}$ t_{PP} (in the living room)$_{\Phi}$ (yesterday)$_{\Phi}$)ι (**AT THE MAN WHO LIVED NEXT DOOR**)ι

In (68), I analyze the preposition *at* as a non-focused element since it is not moved rightward. The non-focused element does not undergo Focus Restructuring, and therefore the illegitimate phonological constituent cannot be modified through the operation. In contrast, (69) is phonologically legitimate since the preposition forms a phonological constituent with a following nominal phrase. Thus, the current approach explains the contrast in (67a, b).[11]

Next, let us move on to another restriction on P-stranding illustrated in (70), which shows that P-stranding is disallowed if a preposition is left alone within a rightward moved position (cf. Inkelas and Zec (1990), Uchishiba (2008), Shiobara (2010) and others).[12]

(70) a. **WHOM** did John write the letter **TO** t_{wh}?

b. ***WHOM** did John write the letter t_{PP} yesterday [$_{PP}$ **TO** t_{wh}]?

Sentence (70a) involves just the P-stranding *wh*-movement while sentence (70b) further involves the step of rightward PP movement (the PP *TO WHOM* first moves across the temporal adverb *yesterday*, and then the *wh*-phrase *WHOM* is extracted from there). Remember from (42) and (43) in section 4.3.3 that a rightward-moved material forms an ι-phrase independently. The current phonological analysis can explain the contrast by appealing to the fact that an ι-phrase boundary blocks Focus Restructuring. Then, the sentences in (70) have the following derivations:

(71) a. (**WHOM**)$_{\Phi}$ (did John)$_{\Phi}$ (write)$_{\Phi}$ (the letter)$_{\Phi}$ (**TO**)$_{\Phi}$

→ Focus Restructuring

b. (**WHOM**)$_{\Phi}$ (did John)$_{\Phi}$ (write)$_{\Phi}$ (the letter **TO**)$_{\Phi}$

(72) ((**WHOM**)$_{\Phi}$ (did John)$_{\Phi}$ (write)$_{\Phi}$ (the letter)$_{\Phi}$ (yesterday)$_{\Phi}$)$_{\iota}$ ((**TO**)$_{\Phi}$)$_{\iota}$

→ Focus Restructuring is blocked

In (71), the stranded preposition is added to the preceding Φ-phrase, and forms a legitimate Φ-phrase. In contrast, in (72), an ι-phrase boundary blocks the desired prosodic restructuring. Thus, only the former is phonologically licensed and grammatical.

Along the same line, P-stranding is restricted in other cases involving ι-phrasing. Specifically, a preposition cannot be left directly on the right of a parenthetical and an NRR, which form an ι-phrase independently.[13]

(73) a. ??**WHICH YEAR** did John reach the South Pole, as his friends hoped, **IN**?

b. ??**WHICH ROOM** did John read Mary's book, which was written in 2010, **IN**?

These sentences have the following phonological structures.

(74) a. **WHICH YEAR** did John reach the South Pole (as his friends hoped)$_{\iota}$ (**IN**)$_{\Phi}$

b. **WHICH ROOM** did John read Mary's book (which was written in 2010)$_{\iota}$ (**IN**)$_{\Phi}$

Here, Focus Restructuring is disturbed by the ι-phrase boundaries. Since the illegitimate phonological constituent is left, these P-stranding sentences are degraded.[14, 15]

Thus, various restrictions on P-stranding are all explained by the current proposal. P-stranding is licensed if a PP including a moved phrase is focused

because a legitimate phonological structure can be obtained through Focus Restructuring. On the other hand, P-stranding is disallowed if Focus Restructuring does not work to form legitimate phonological constituent or the prosodic restructuring is prevented by an ι-phrase boundary.

4.4.3 Comparison with a Previous Phonological Analysis

Before closing this section, I review a previous phonological analysis of P-stranding proposed by Uchishiba (2008). Like mine, his analysis assumes that P-stranding is licensed if a legitimate phonological structure is obtained. On the other hand, this analysis differs from mine in syntax-phonology mapping theory. Specifically, his analysis is based on the *Optimality Theory*, according to which (i) several mapping constraints are ranked relative to each other, and (ii) an "optimal" phonological representation is chosen among various candidates if it obeys highly ranked constraints more than any other candidates. Uchishiba adopts the constraints in (75) from Selkirk (1996, 2000) and Truckenbrodt (1995, 1999).

(75) a. *Align-XP,R*

Each XP is aligned with the right edge of a Φ-phrase.

b. *Wrap-XP*

Each XP is contained in a Φ-phrase.

c. *Align-Foc*

Each focused constituent is aligned with the right edge of a Φ-phrase.

First, *Align-XP,R* requires a Φ-phrase boundary after each syntactic phrase. Second, *Wrap-XP* requires a string of a syntactic phrase to be included within a single Φ-

phrase and not to be separated into two or more Φ-phrases. Third, *Align-Foc* demands a Φ-phrase boundary after each focused constituent. In addition to these constraints, he assumes the following ranking hierarchy:

(76) *Align-Foc* > *Align-XP,R* = *Wrap-XP*

(76) means that *Align-Foc* is ranked higher than *Align-XP,R* and *Wrap-XP*, and the latter two are ranked equally. Furthermore, he assumes with Truckenbrodt (1995, 1999) that the mapping rules apply only to overt lexical heads and their projection, but not to functional heads, empty heads or their projections.

According to the above assumptions, sentence (77a) has the phonological structure of (77b). (Although v-head is usually regarded as a functional category, it can be a target of mapping rules because this position is occupied by a lexical verbal element *go*.) Here, following Uchishiba, I place a phonological structure under the line of a syntactic one.[16]

(77) a. **WHICH VACATION** did John go to Hawaii **DURING**? (= (60a))

b. **WHICH** [**VACATION**]$_{NP}$ did [John]$_{NP}$ [[v-go t_{go} to Hawaii]$_{VP}$

(**WHICH VACATION**)$_{\Phi}$ (did John)$_{\Phi}$ (v-go t_{go} to Hawaii

[**DURING** t_{wh}]$_{PP}$]$_{vP}$

DURING t_{wh})$_{\Phi}$

Here, Wrap-XP requires the string of vP to be included in a single Φ-phrase. As a result, VP-adjunct *during which vacation* is also included within the same Φ-phrase. Since the resulting phonological structure is legitimate, P-stranding is allowed.

Then, let us turn to the ungrammatical case in (78a) with a syntactic structure and a phonological one in (78b).

(78) a. *Which vacation did John go **TO HAWAII** during? (= (60b))

b. which [vacation]$_{NP}$ did [John]$_{NP}$ [[v-go t_{go} **TO HAWAII**]$_{VP}$

(which vacation)$_{\Phi}$ (did John)$_{\Phi}$ (v-go t_{go} **TO HAWAII**)$_{\Phi}$

[during t_{wh}]$_{PP}$]$_{vP}$

during t_{wh}

Here, the highest ranked constraint *Align-Foc* requires a Φ-phrase boundary after the focused word *TO HAWAII*. Then, the prosodic boundary isolates the stranded preposition from the remainder of the sentence. At this stage, the isolated preposition is not mapped into the phonological representation since mapping rules do not target function words. Consequently, the phonological structure is illegitimate in that it does not contain the stranded preposition. Therefore, this P-stranding sentence is disallowed.

Based on the phonological analysis, Uchishiba accounts for a variety of P-stranding data in his paper, but his analysis has some empirical problems. First, this analysis incorrectly licenses some ungrammatical P-stranding sentences. Given Uchishiba's analysis, a negative question and a HNPS sentence repeated from (64b) and (67a) receive the phonological structures in (79) and (80), respectively.

(79) a. *Who **DIDN'T** John go to Hawaii with?

b. [who]$_{NP}$ **DIDN'T** [John]$_{NP}$ [v-go t_{go} [to Hawaii]$_{PP}$ [with t_{wh}]$_{PP}$]$_{vP}$

(who)$_{\Phi}$ (**DIDN'T**)$_{\Phi}$ (John)$_{\Phi}$ (v-go t_{go} to Hawaii with)$_{\Phi}$

(80) a. *John looked at in the living room yesterday the man who lived next door.

b. [John]$_{NP}$ [v-look t_{look} [at t_{DP}]$_{PP}$ [in the living room]$_{PP}$ [yesterday]$_{AdvP}$]$_{vP}$

(John)$_{\Phi}$ (v-look t_{look} at t_{DP} in the living room yesterday)$_{\Phi}$

THE [**MAN**]$_{NP}$ **WHO** [**v-LIVE** t_{live} [**NEXT DOOR**]$_{AdvP}$]$_{vP}$

(**THE MAN**)$_{\Phi}$ (**WHO** **V-LIVE** t_{live} **NEXT DOOR**)$_{\Phi}$

The schemas of (79b) and (80b) include a legitimate Φ-phrases that contain the stranded prepositions because the constraint *Align, Foc* does not disturb such Φ-phrasing. Therefore, this analysis incorrectly predicts that these sentences are phonologically licensed.

In addition, Uchshiba's analysis is also problematic with his structural assumption. In his analysis, P-stranding in (77) is licensed because a stranded preposition is contained within a large Φ-phrase corresponding to vP. According to this analysis, a preposition of an adjunct-PP has to be included in the vP so that it can be included in a large Φ-phrase corresponding to the vP. However, P-stranding seems to be possible even if an adjunct-PP is adjoined to above vP. Consider sentence (81).

(81) A: Which party might John have written a letter after?

B: I heard that he might ~~have written a letter~~, but I do not know after which party he might have done so.

Here, A's utterance contains an adjunct-PP and B's utterance includes VPE. The VPE domain in (81B) is designed to contain PerfP headed by the perfective auxiliary *have*, but not to contain temporal PP (continuation in (81B) is designed to guarantee

that speaker B heard that John might have written a letter without information about the timing of writing a letter). This means that the elided PerfP does not contain a temporal PP. Then, given that ellipsis requires parallelism between an ellipsis site and its antecedent, the adjunct-*wh*-PP must not be contained within the parallel domain. That is, the adjunct-*wh*-PP is introduced outside PerfP. However, if the stranded preposition *after* is located outside PerfP, P-stranding should not be licensed under Uchishiba's analysis because the preposition cannot be contained within a Φ-phrase corresponding to vP.

(82) …[he t_{might}[[have [v-write[t_{write} a letter]$_{VP}$]$_{vP}$]$_{PertP}$ after t_{wh}]$_{PertP}$]$_{TP}$…

…(he)$_{\Phi}$ t_{might} have v-write t_{write} a letter)$_{\Phi}$ after t_{wh}

Thus, the P-stranding data cannot be explained by Uchishiba's analysis.

On the other hand, my analysis correctly predicts the grammaticality. I give the *wh*-question in (81A) the following phonological structure.

(83) a. (**WHICH PARTY**)$_{\Phi}$ (might John)$_{\Phi}$ (have written)$_{\Phi}$ (a letter)$_{\Phi}$ (**AFTER**)$_{\Phi}$

→ Focus Restructuring

b. (**WHICH PARTY**)$_{\Phi}$ (might John)$_{\Phi}$ (have written)$_{\Phi}$ (a letter **AFTER**)$_{\Phi}$

The stranded preposition is incorporated into the preceding Φ-phrase through Focus Restructuring. The resulting phonological structure is legitimate, and hence this P-stranding is licensed.

In this subsection, I have argued that my analysis is superior to Uchishiba's one. My analysis has two advantages over it. First, Uchishiba's analysis overgenerates

P-stranding in a negative question and a HNPS sentence while my analysis correctly excludes them. Second, Uchishiba's analysis incorrectly prohibits P-stranding at higher than vP, but my analysis correctly allows it.

4.5 Conclusion

This chapter proposes a phonological analysis of some linguistic phenomena concerning ellipsis and movement, which strand a function word. My analysis starts by introducing Sato and Dobashi's (2016) phonological analysis of the *that*-trace effect. They propose that a subject cannot be extracted from behind an overt complementizer because this operation leaves within a Φ-phrase only a phonologically weak function word (complementizer) that is insufficient to form the phonological unit. This operation may be licensed if illegitimate phonological constituents are modified to legitimate ones. Sato and Dobashi (2016) adopt the Focus Restructuring rule proposed by Kenesei and Vogel to explain some amelioration effect on the *that*-trace effect. Although their analysis is limited to the *that*-trace effect, I argue that the phonological analysis holds for other cases such as VPE and P-stranding movement. These ellipsis and movement are blocked if their phonological outputs become illegitimate, but they are licensed if a legitimate phonological structure is obtained through Focus Restructuring. I have demonstrated that the proposed analysis explains some restrictions on VPE and P-stranding. Then, I have compared previous analyses and mine, and shown that my analysis is superior to them.

Notes to Chapter 4

* This chapter is a revised and extended version of Saito (2018).

1. Depending on theories, other phonological constituents have also been assumed such as clitic group (the constituent between prosodic word and Φ-phrase), foot and syllable (the constituents smaller than prosodic word) and others. However, I do not discuss how many constituents we need. It is out of the purpose of this chapter.

2. One might wonder whether Focus Restructuring approach provides a legitimate phonological structure even for (4a) by putting focus on a complementizer: If a complementizer is focused, then it is incorporated into a preceding Φ-phrase to form a legitimate phonological structure. However, it seems to be difficult to check this possibility in (4a) because of the semantic property of complementizers: They do not show new information and hence cannot be focused (cf. Kim (2001)). I assume that focus is put on complementizers in (6) because of the property of RNR, and the same focus assignment is impossible for (4a).

3. The focus is what is called *Polarity Focus* or *Verum Focus*, which is put on a head dedicated for sentence polarity Σ (see Laka (1990)) and typically realized on T-elements.

4. In fact, there is another way to phonologically analyze the grammaticality of VPE in finite clauses. Selkirk (1996) proposes that focused function words are phonologically strong enough to form a Φ-phrase. (However, the focus effect does

not seem to apply to all function words. Specifically, Zwicky (1982) observes that an infinitive marker is phonologically insufficient even if it appears as Fragment Answer.) If function words can be strong, VPE in finite clauses may be phonologically licensed even without Focus Restructuring. Given the alternative approach, we face a problem of which strategy we should take to analyze the grammaticality of VPE in finite clauses. I leave close investigation of the problem for future research.

5. I have to note that an adverb does not improve grammaticality of VPE unlike a subject or a negation.

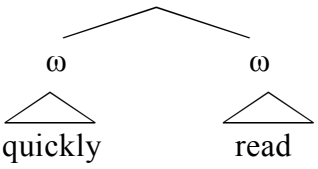
(i) *You should behave politely, and always to __ will make you a great man.

This is problematic because the VPE is impossible even though the infinitive marker can phonologically depend on the adverb. In order to solve this problem, I assume that the ungrammaticality of (i) is derived from the phonological property of modifiers. Richards (2016) assumes that preverbal adverbs phonologically "adjoin" to verbs that they modify, and explains the contrast in (ii).

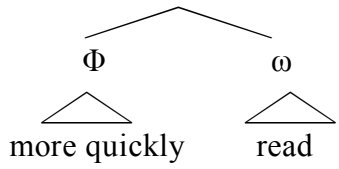
(ii) a. She has quickly read the book.
b. *She has more quickly than I have read the book.

(ii) shows that an adverb can be located at the preverbal position but an adverbial clause cannot. Richards gives them the following phonological structure.

(iii) a.



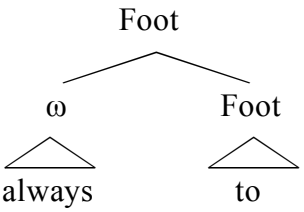
b.



In (iiia), phonological adjunction yields a phonological structure where a prosodic word (ω) dominates the same kind of phonological constituent. This structure does not pose any problem within the current phonological literature. In contrast, the phonological structure of (iiib) is problematic in that a prosodic word dominates a phonological phrase: Since a prosodic word is smaller than a phonological phrase, the former cannot dominate the latter in accordance with the prosodic hierarchy (see the hierarchy relation in (1)). Therefore, only the sentence in (iia) is grammatical.

Along this line, sentence (i) has a phonological constituent in (iv). Here, I assume that an infinitive marker forms at most a foot (F), a phonological constituent smaller than ω (cf. Selkirk (1996)).

(iv)



The adverb phonologically adjoins to the infinitive marker, and hence the label of the whole constituent is Foot. Then, the Foot dominates a larger phonological constituent, prosodic word, though the dominance relation is illegitimate. Thus, adverbs cannot improve grammaticality of VPE in infinitival clauses: It introduces another problem because of its adjunct property.

6. This Copy Deletion is what I have called "PF-Copy Deletion" in chapter 3. This deletion operation applies at the phonological component so as to realize only one copy.

7. In analyzing VPE in infinitival adjunct clauses, we cannot appeal to ι-phrasing since previous works observe that a right-adjoined adjunct clause does not always form an ι-phrase boundary (cf. Selkirk (2005)).

8. Previous studies observe that VPE in infinitival adjunct clauses is sometimes prohibited even when an infinitive marker has its prosodic host within the same clause.

(i) *Mary hates to cook, so she buys groceries (in order) for Bill to __.

(Zagona (1988: 109))

Here, VPE is ungrammatical even though the infinitive marker has its prosodic host, subject noun *Bill*, within the adjunct clause. However, in contrast to (i), O'Flynn (2008) observes that a similar case is grammatical.

(ii) Almost everyone else will pass the course, but [for Harvey to __], he'll have to make up ten assignments.

I cannot explain why sentences in (i) and (ii) are different in their grammaticality. I leave this problem for future research.

9. Precisely, Takami refines the generalization. He proposes that P-stranding is

possible if "a moving NP itself" is more important than any other words within a sentence, pointing out sentence (i):

(i) */??Which building did John wait for Mary **OUTSIDE**/**INSIDE** (of)?

(Takami (1988: 325))

Takami attributes the ungrammaticality of (i) to the fact that the stranded preposition is more important than any other word (he assumes that the prepositions has important information (i.e. they are focused) because they lexically have contrastive focus). However, this argument is unreasonable because a contextually focused preposition can be stranded.

(ii) Which party did John go to Hawaii **AFTER**? (not before)

Therefore, I maintain the original generalization that P-stranding is possible if focus is placed on a PP including a moved material.

10. In my analysis, I assume that a stranded preposition is insufficient to form a Φ-phrase (cf. Uchishiba (2008) and Shiobara (2010)). However, one might consider that a stranded preposition can form a Φ-phrase by itself because focus prominence strengthens phonological status of a preposition. I argue against this possibility by pointing out that focus prominence is placed on another element. In fact, Takami (1988) observes that focus prominence is placed on a moved nominal phrase in P-stranding sentences. Given the observation, I maintain the assumption that prepositions are phonologically insufficient to form a Φ-phrase.

11. P-stranding HNPS is often contrasted with RNR construction, which is often analyzed as grammatical P-stranding rightward-movement.

(i) Mary talked **ABOUT**, and John **CRITICIZED**, the paper you presented at the LSA last year. (Ha (2008: 37))

The grammaticality of (i) is also phonologically explained. Remember from section 4.2 that a final word in each conjunct of RNR is focused. Then, the focused preposition *ABOUT* undergoes Focus Restructuring.

(ii) (Mary)$_{\Phi}$ (talked **ABOUT**)$_{\Phi}$ (and John **CRITICIZED**)$_{\Phi}$ the paper you presented at the LSA last year

Since the phonological structure is legitimate, P-stranding is grammatical in this construction.

12. One might think that the ungrammaticality is reducible to Freezing Effects, which prohibits extraction from a moved phrase. However, extraction out of a rightward-moved phrase seems to be possible as indicated by sentence (i):

(i) What do you believe sincerely that Natasha likes? (An (2007: 78))

Here, the *wh*-phrase can be extracted from the rightward-moved CP. Therefore, I do not attribute the ungrammaticality of (70b) to Freezing Effect.

13. Judgment in (73) is not so clear as the counterparts of VPE in (36) and (38). I have no idea about the difference among function word stranding operations. I leave this problem for future research.

14. Unfortunately, I cannot take clear data concerning other constructions that involve ι-phrasing such as RNR and gapping. I cannot explain why, and hence I leave this problem for future research.

15. We predict that, even when a PP is isolated by an ι-phrase boundary, P-stranding might be licensed if a stranded preposition has its prosodic host inside the ι-phrase. However, it is too difficult to make such examples for P-stranding because a potential prosodic host for a stranded preposition is an adverb, which cannot fulfill the desired role (see note 5). In fact, the grammaticality of P-stranding does not improve even if an adverb is added as in (i).

(i) *Whom did John write the letter yesterday (just) to?

16. In fact, Uchishiba analyzes only moved DPs as focused, according to Takami (1988) (see note 9). However, I remain to assume that a PP contains a moved DP is focused when I illustrate Uchishiba's analysis because this difference is not important to introduce Uchishiba's analysis.

Chapter 5

Conclusion

In this thesis, I have investigated derivations from syntax to phonology within the framework of Minimalist Program, and explained restrictions on some linguistic operations or phenomena.

In chapter 2, I have deduced restrictions on Late Merge (LM) from a phase-based condition on syntactic operations, that is, the Phase Impenetrability Condition. This proposal prohibits LM from applying to syntactically inaccessible positions, and thus explains two restrictions observed by Landau (2007) and Sauerland (1998): (i) LM cannot apply inside a fronted predicate and (ii) Multiple adjunction must apply cyclically. I have applied the same explanation to a new observation that LM cannot apply to a conjunct of a coordinated NP. Furthermore, I have explained some A-movement/A'-movement asymmetries regarding Condition C by proposing LM of a restrictor NP, which is a natural consequence of the phase-based approach.

In chapter 3, I have proposed a new labeling mechanism based on Copy Deletion within Narrow Syntax. This proposal solves a problem with the original labeling algorithm proposed by Chomsky (2013): labeling in A'-movement environments. Furthermore, the labeling mechanism explains restrictions on some phonological phenomena that are triggered by copies interpreted at the PF interface. I have demonstrated that my proposal explains the distribution of some phonological phenomena such as contraction, exceptional copy realization, VP-ellipsis standing an infinitive marker and cliticization of an infinitive auxiliary.

In chapter 4, I have attributed restrictions on VP-ellipsis and preposition

stranding movement to a constraint on their phonological structures. Arguing that syntactic operations are constrained in terms of the legitimacy of their phonological outputs (cf. Sato and Dobashi's (2016) analysis of the *that*-trace effect), I have presented a unified account of these different phenomena. Specifically, I have demonstrated that the relevant ellipsis and movement are licensed if the resulting phonological structures are legitimate, while they are prohibited if such legitimate phonological structures cannot be obtained for some reasons.

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